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Chapter 1 General Provision

1.1 Introduction

1.1.1 This document (or "Technical Specifications" (or "TS") or "Part VII") sets out the requirements of the Government of the Hong Kong Special Administrative Region ("HKSAR") of the People's Republic of China (hereinafter referred to as the "Government") in relation to twelve (12) **Medium Patrol Launches (each a "MPL" or "Vessel")** for use by the Hong Kong Police Force ("**HKPF**" or "**user department**").

1.1.2 Unless otherwise specified in the TS, all the specifications stated in this Part VII of the Tender Document are classified and labelled as follows:

(a) Essential Requirements **[E]**;

(b) Those specifications which are without any label (viz., **[E]** or [D]) ("Specifications without Label"); and

(c) Desirable Specifications [D].

1.1.3 As part of the tender evaluation during the tendering stage (viz., completeness check), the Tenderer shall submit all the information sufficiently detailed to substantiate that the product and the services offered meet the Essential Requirements as stipulated in Annex C to Part II - the Conditions of Tender, failing which its tender will not be considered further.

1.1.4 All (a) Essential Requirements **[E]**, (b) if and to the extent the Contractor has indicated compliance, Specifications without Label, and (c) if and to the extent the Contractor has indicated compliance, Desirable Specifications labelled with [D], shall also form part of the Contract and be of equal materiality and importance upon the award of the Contract. Where the Tenderer has indicated non-compliance with any Specification without Label, it shall have proposed Counter-Proposals to such Specifications without Label in accordance with Clause 17.3 of Part II – Conditions of Tender for the Government's evaluation.

1.1.5 The Vessel shall be Ready for Use before the Delivery Date and delivered by the Delivery Date as per the schedule stipulated under Schedule 2 – Delivery Schedule of Part V.

1.1.6 Unless otherwise expressly defined in the Contract, all technical terms and expressions used in this Part VII shall be interpreted in accordance with the professional or common usage in naval architecture, marine engineering, nautical navigation and the shipbuilding industry.

1.1.7 Where design specifications of the Vessel or any Equipment are required to be approved by the specified Recognized Organization ("RO"), they must be approved by the specified RO as well as by the Government New Construction Section ("GNC") and HKPF prior to the manufacture of the Vessel or procurement of such Equipment by the Contractor (as the case may be) (collectively, "GNC/HKPF"). Where the design specifications of the Vessel or Equipment (as the case may be) are not required to be approved by the specified RO, they must be approved by GNC/HKPF prior to the manufacture of the Vessel or procurement of such Equipment by the Contractor.

1.1.8 For the avoidance of doubt, references to "tests" throughout the Tender Documents and the Contract shall include all inspections, surveys, assessments, trials and experiments.

1.1.9 Without prejudice and in addition to the interpretation principles set out in Clause 1.2 of the Part IV – Conditions of Contract, the following interpretation principles shall apply when interpreting the Tender Documents and the Contract including this Part VII:

(a) references to "Chapter" or "Paragraph" or "Annex" refer to the chapter of or the paragraph

of or the Annex to this Part VII;

(b) quotation marks may or may not be added for each defined term whether with or without brackets; a defined term may be identified with quotation marks and brackets, or just quotation marks, or just brackets;

(c) the use of the article "the" may or may not appear before a defined term or an abbreviated term; there shall be no difference whether the term is preceded with or without the article;

(d) a defined term may have two or more versions (typically a longer version and an abbreviated version) (e.g. "Factory Acceptance Tests" or "FAT"); or may still be referred to by the original description of the subject matter based on which the term is defined; the original description; or the longer version of the defined term; or the shorter version of the defined term may be used interchangeably. For clarity sake, the original description, or the longer version may be used for more self-explanatory purpose; however, there shall be no difference;

(e) where a subject matter has been defined with two or more alternative terms of reference, any one of these terms of reference may be used interchangeably;

(f) a defined term may appear earlier than the provision in which it is defined; a term defined will have the same meaning throughout the document;

(g) there shall be no difference between a term with a hyphen and the same term without a hyphen (e.g., "sub-system" or "subsystem");

(h) titles and headings may appear in lower case or upper case throughout or only in upper case with the first word at the beginning; there shall be no difference in meaning;

(i) headings and titles do not affect the construction of the Tender Documents and the Contract;

(j) a sub-Section of this Part VII (at whichever sub-level and regardless of the numbering system adopted) may begin in upper or lower case and may be ended with semi-colon or full stop; these differences do not have any interpretation significance on their own;

(k) figures may be expressed in Arabic numerals or in words; or both; there shall be no difference; three zeros in a figure may or may not be separated by any space or comma; there shall be no difference; and

(l) where more than one unit of a subject matter is to be supplied as part of the Work, all requirements stated to be applicable to that subject matter shall apply to each such unit of that subject matter. This is regardless of whether the term "each of" or other cognate expression is used preceding that subject matter. This principle shall apply including without limitation where the subject matter is the Vessel and the Equipment on each Vessel.

1.2 Statement of Purposes of the Vessel

1.2.1 The Vessels to be procured shall be twelve (12) marine aluminium alloy Mono-hull high speed craft powered by waterjet propulsion system.

(a) The operational requirements of the Vessel are mainly as follows:

(1) Performing patrol to check compliance by vessels in Hong Kong waters with all applicable laws and regulations;

(2) Officer conveyance; and

(3) Casualty evacuation.

(b) In addition, the Vessels are also to be deployed to perform other maritime law enforcement roles from time to time such as:

(1) Operational Incident Response;

(2) Policing support to outlying islands and remote areas;

(3) Logistical support;

(4) Deceased Persons Recovery;

(5) Search and Rescue (SAR) in Hong Kong Waters;

(6) Disaster Relief;

(7) Immigration, Excise and Conservancy Law Enforcement;

(8) Maritime Security;

(9) Counter Terrorism;

(10) Explosive Ordnance; and

(11) Dive Support.

1.3 Authorities

1.3.1 The GNC of the Marine Department ("MD") is the section responsible for the procurement of the Vessel for the Government. GNC may delegate the site supervision work, including plan reviewing work during the construction stage to one or more private consultancy firm(s) on behalf of the Government.

1.3.2 Communications Branch ("COMMS") is the technical section within HKPF, which will oversee the work to be provided by the Contractor in connection with the Operational Systems as defined in Paragraph 9.1 of this Part VII and carry out the Technical Acceptance of the Operational Systems on behalf of the Government.

1.3.3 The HKPF is the end user of the Vessel and will participate in tests, inspections and trials together with GNC viz., the Technical and Delivery Acceptance of the Vessel on behalf of the Government.

1.4 Tenderer and Contractor

1.4.1 In addition to the drawings and information included in the Technical Proposal for the Vessel offered in its tender submission, the Contractor is obliged to prepare and submit comprehensive and detailed technical specifications of the Vessel, together with all necessary drawings and information, as required in this Part VII within the specified period of time and to the satisfactory acceptance by the RO, GNC and HKPF. If no period is specified, they shall be submitted and approved by the RO, GNC and HKPF (as the case may be) before the construction of the relevant part of the Vessel. Without prejudice to the Contractor's obligations for compliance with all contract requirements set out in this Part VII (viz. all essential requirements, all requirements not marked as essential, and all desirable specifications committed by the Contractor) and any rights of the Government under the Contract or otherwise, the Contractor shall submit to GNC and HKPF supplementary drawings, information and deliverables that may be deemed necessary for the design and construction of the Vessel as required in Items 1 to 14 (Essential Requirements in Part VII) of Schedule 5 and other relevant parts of the Contract where applicable. Any intended technical solutions to be proposed by the Contractor to ensure the Vessel's compliance with each individual paragraph of the Technical Specifications shall be at least equivalent to or no less favourable than the respective contract requirements set out in this Part VII or otherwise, and shall be subject to the prior acceptance by GNC and HKPF before implementation of such intended technical solutions. In case of any discrepancies on interpretation of the technical

specifications stipulated in this Part VII between the Contractor and the Government, the final decision on such intended technical solutions in fulfilling the fit-for-purpose standards and requirements shall be vested in GNC and HKPF.

1.5 Shipyard

1.5.1 The Contractor's nominated shipyard for building the Vessel must have the essential shipbuilding and workshop facilities such as lifting gear, hull construction and calibration equipment, machinery installation and calibration equipment and vessel launching or slipping facilities.

1.5.2 The Contractor shall employ a team of professional staff to carry out the design of the Vessel and also carry out supervision and quality control work in the course of the Vessel construction.

1.6 Design and Construction Responsibility

1.6.1 The Vessel shall be designed and constructed for a service life of not less than fifteen (15) years under maintenance which is normally expected for the Vessel.

1.6.2 It is the sole responsibility of the Contractor to supply a Vessel which is safe, fit and suitable for the intended operational purposes of HKPF as set out in Paragraph 1.2.1 above and which meets all relevant regulations and all specifications, which include without limitation requirements for safety, health, environmental protection, hull form design features, structure, method and materials for construction and fitting out, stability, subdivision and operational efficiency.

1.6.3 The Vessel shall be designed and constructed in accordance with the rules and regulations of the RO as specified in Schedule 9 of Part V in the version as at the Contract Date unless the rules and regulations of RO specify that version of such rules and regulations as at the keel laying date of the Vessel shall apply in relation to the relevant requirements specified therein. Unless otherwise expressly stipulated in this Part VII, (a) references to "the RO" in this Part VII shall mean the RO as specified in Part V, Schedule 9; and (b) references to "the RO Requirements" shall mean the requirement of the rules and regulations of the RO as specified in Part V, Schedule 9. Notwithstanding the foregoing, where it is expressly permitted in this Part VII that in relation to any particular requirement (instead of the RO specified in Part V, Schedule 9) another RO which is any one of the RO's listed in Annex 9 to this Part VII may be designated for confirmation of compliance with the relevant requirement, references to "RO" shall mean any such other RO. References to "IMO requirements" shall mean the latest and as amended requirements published by the International Maritime Organization ("IMO") and available on its website and applicable to the relevant subject matter in the relevant paragraph where it is required that IMO requirement shall be complied with provided that where the IMO requirements are of any convention or resolution or other multilateral treaty of the IMO (including any amendment thereto), Hong Kong has joined in as a party to such IMO requirements.

1.6.4 The Vessel is required to be issued with a full certificate of classification society with notations by the RO as specified in Part V, Schedule 9, as one of the conditions, before the Acceptance Certificate for the Vessel may be issued. All plans, particulars and documentation which are required for the classification of the Vessel by the RO, in addition to those listed in Annex 3 to this Part VII shall be approved by the RO before submission to GNC for endorsement and final approval prior to commencement of the manufacturing work of the Vessel. Any subsequent modifications or additions shall be treated in the same manner. Those drawings which are not required for approval by the RO shall still be submitted to GNC for approval before work is carried out.

1.6.5 The Contractor shall design, build and supply the Vessel in full compliance with all requirements

of the Contract including without limitation the Warranties, this Part VII and the Schedules; which may be over and above what is normally required by any statutory and/or RO's rules and/or regulations. Should there be any contradiction between the rules and regulations of the RO and this Part VII, this Part VII shall prevail unless GNC stipulates or agrees otherwise.

1.6.6 Notwithstanding the submission of the preliminary plans and drawings by the Contractor then as part of its tender for the Contract, all plans and drawings of the Vessel except the design stresses and scantling, shall be submitted to GNC for approval before completion of the Vessel design.

1.6.7 Even if the Contractor appoints a Sub-contractor to design the Vessel with the prior written consent of the Government, the Contractor shall not be relieved of its obligations under the Contract through such appointment, and the Contractor shall be responsible for all acts, defaults and omissions of the sub-contractor as if they were its own.

1.7 Survey and Inspection

1.7.1 Tenderers shall note that the unit price per Vessel as quoted in Part V, Schedule 1, shall be deemed to have included the cost of surveys to be carried out by the relevant RO in respect of that Vessel (if required to be arranged by the Contractor under the Contract).

1.7.2 All electronic items and their installation shall be approved and inspected by COMMS or COMMS representatives as part of Stage 3 of the Technical Acceptance.

1.7.3 Subject to Paragraph 1.7.8 of this Part VII, and unless the Government waives the same in writing, an advance written notice of not less than thirty (30) working days, must be given to GNC before the representatives of GNC and other Government officers are invited to conduct a survey visit of the Vessel. If insufficient notice is given the Government reserves the right only to make such visit after the appointed date and the liability for any delay resulting therefrom shall be borne by the Contractor including any liquidated damages payable under Schedule 4 to Part V.

1.7.4 The Contactor shall provide:

(a) An Implementation Timetable, in the form set out in Annex 2 to this Part VII, setting out the major milestones and their scheduled completion dates and incorporating the Delivery Dates specified in Schedule 2 of Part V;

(b) The Drawing Submissions Timetable in the form set out in Annex 3 to this Part VII; and

(c) The Main Items Inspection Timetable in the form set out in Annex 4 to this Part VII.

Each one of the above shall be submitted to GNC for approval by the respective deadlines specified in Clause 11 of Part IV - the Conditions of Contract.

The Delivery Date(s) for the Vessel(s) as stated in the Implementation Timetable shall be no later than those set out in Schedule 2 of Part V.

1.7.5 Notwithstanding anything in the Contract to the contrary, the Government may suspend payment of any of the instalment specified in Schedule 3 of Part V of the Contract if any of the timetables required herein has not been submitted for GNC's approval or GNC does not approve any of them or if the progress of work does not comply with any of them as approved by GNC.

1.7.6 A weekly work progress report with photos evidencing the progress and material/equipment procurement status is required to be submitted to GNC during the construction of the Vessel. The weekly report shall be submitted before noon of every Monday. The Contractor shall provide supporting evidence, including but not limited to photos and videos, to demonstrate that the milestones have been completed according to the completion dates stated in the submitted Implementation Timetable in Annex 2 to Part VII.

1.7.7 GNC may designate consultant(s) from the private sector who will be authorised to represent GNC in all technical matters including site visit and plan approval related to the construction of

the Vessel. The Contractor shall cooperate with the consultant(s) and afford unhindered access to the Vessel at all times during working hours and shall furnish current copies of all drawings, sketches, correspondence, change notices, change orders, test agendas, schedules and other necessary documents where applicable. For the Main Items Inspection Timetable set out in Annex 4 to this Part (even in the version approved by the Government), the GNC consultant will further elaborate such timetable by including and expanding on these items into an on-site supervision programme ("Programme"), and which Programme shall be deemed to form part of the Contract and superseding Annex 4 (even in the aforesaid approved version) in the event of any inconsistency where the Programme is more detailed than Annex 4 to this Part. All these inspections, tests and trials must have been performed to the satisfaction of the Government before the Vessel may be shipped to Hong Kong (unless it is expressly stated in Annex 4 to this Part that certain items shall be performed in Hong Kong as part of the Delivery Acceptance)

1.7.8 After arriving at site for a survey visit, if GNC officers or consultants consider that it is unsafe to carry out the test or inspection, the test / inspection will not be carried out. The Contractor shall arrange for another additional survey visit at the Contractor's expense. The Government shall not be responsible for any delay arising from any postponement in conducting the survey visit due to any safety issue as specified in this paragraph.

1.7.9 Where any fee charge and associated expenses are payable for the services of the RO, which are necessary in order to fulfil any obligation of the Contractor under the Contract, the Contractor is responsible for paying the RO all such fees, charges and associated expenses. Such fees shall include charges for drawing approval, surveys (if deemed necessary), issue of certificates, and any other expenses payable to the RO.

1.7.10 The Contractor shall provide office space for GNC officers, HKPF officers and consultants during their survey visits and construction progress visits to the Vessel at the shipyard where the Vessel is being constructed. The office space shall include, but not be limited to, two (2) desks, four (4) chairs, one (1) telephone, one (1) conference table, drinking facilities, power supply and one (1) cupboard for storage of documents and working clothes. The space provided by the Contractor shall also be fitted with air conditioning/heating, have internet access with WiFi connection, and a copying and printer machine. Cleaning of the space shall be carried out on each working day.

1.7.11 The hours of work of the GNC officers, HKPF officers or consultants will be arranged to coincide with those of the shipyard, insofar as is practicable to do so. It is intended that all reasonable steps are taken so that the duties of the GNC officers and consultants can be carried out with maximum efficiency and minimum interference with the Contractor's work.

1.8 Procedures for Vessel Acceptance

1.8.1 Stage 1 of Technical Acceptance - Pre-Shipment Construction and Handling Inspection

(a) Safety of Vessel for Pre-Shipment Construction and Handling Inspection
Prior to conducting the Pre-Shipment Construction and Handling Inspection, an Inclining Experiment as specified in Paragraph 3.3.4 of this Part VII shall be carried out and the final lightship weight and centre of gravity shall have been determined and approved by the RO and GNC. All loading conditions used during the Pre-Shipment Construction and Handling Inspection shall be compiled using the approved final lightship weight and centre of gravity and shall meet the intact and damage stability criteria as specified in Paragraphs 3.3.9 and 3.3.10 of this Part VII respectively. Other documentary evidence acceptable to the Government showing that the Vessel is safe to go to sea for the intended tests and trials specified in the Contract shall be submitted as part of the aforesaid requirements.

(b) Handling Assessment of Vessel

On completion of construction, and prior to shipping to Hong Kong if the building location is outside of Hong Kong, a Handling Assessment for the Vessel shall be carried out as per requirements and procedures as given in Annex 14 to this Part VII at or near the site where the Vessel is constructed.

(c) System Inspection Test

The Contractor shall propose and demonstrate to GNC and HKPF representatives a test protocol to fully demonstrate that the Vessel, the outfitting, machinery, electrical and electronic systems are in complete condition and good working order, as specified in Annex 4 to this Part VII. This will include a practical demonstration of its performance and sea keeping abilities.

(d) Pre-Shipment Speed Trial

Pre-Shipment Speed Trial shall be carried out at or near the site where the Vessel is constructed and shall be carried out in the presence of GNC officers and HKPF representatives or their appointed agents. The same conditions as set for the Official Speed Trial specified at Paragraph 1.8.2 of this Part VII shall apply in which the test is to be carried out.

The purpose of this Inspection will be for the Government to satisfy itself that the Vessel is, in all respects, ready for shipment to Hong Kong (if constructed in a place outside the HKSAR) to undergo the Official Sea Trial. This inspection visit may have been preceded by one or more similar visits following which necessary modification work, if required, has been completed. The Contractor shall provide GNC with one (1) month's advanced written notice of its readiness to invite the Government to conduct the Pre-Shipment Construction and Handling Inspection or, otherwise, as agreed by the Government.

The Pre-Shipment Construction and Handling Inspection of the Vessel shall be conducted at sea in the country in which the Contractor has built the Vessel (if the Contractor has built the Vessel in a place outside the HKSAR) to confirm that the construction of the Vessel conforms with the requirements of Clause 2.5 of Part IV, that any outstanding modification work required to be performed under Clause 2.7 of Part IV, Paragraph 1.2.1 of this Part VII or under any provision of the Contract Documents has been completed satisfactorily. To mitigate the commercial risk which would result from shipment of the Vessel to Hong Kong and possible subsequent failure of the Official Sea Trial specified in Paragraph 1.8.2 of this Part VII, this Pre-Shipment Construction and Handling Inspection shall include but not be limited to a speed trial conducted by the Contractor under the same conditions as set for the Official Speed Trial specified at Paragraph 1.8.2 of this Part VII. The purpose is to enable early identification and rectification of undesirable performance before shipment.

(e) Operational Systems

All Operational Systems which are specified to be tested as per Chapter 9 of this Part VII under Stage 1 - Pre-Shipment Construction and Handling Inspection.

(f) Hull Bottom Inspection

Upon successful completion of the Pre-shipment Speed Trial and Handling Assessment, the Contractor shall arrange a hull bottom inspection on the Vessel for GNC officers to check for any hull damage before shipping to Hong Kong. Any hull damage found shall be rectified at or near the site where the Vessel is constructed.

(g) Factory Acceptance Test

All factory acceptance tests mentioned in this Part VII shall be conducted as part of this Stage 1 of the Technical Acceptance. The Contractor shall provide to GNC, HKPF and where applicable COMMS the test plan and test results of each of the factory acceptance tests for approval before these tests are deemed successfully completed.

(h) Condition for proceeding to Stage 2

After meeting all the requirements of this Stage 1 of Technical Acceptance – Pre-Shipment and Handling Inspection, the Vessel shall then be shipped to Hong Kong and shall proceed to Stage 2 – Official Sea Trial.

1.8.2 Stage 2 of Technical Acceptance - Official Sea Trial

(a) Condition and location of carrying out the Official Sea Trial

The Official Sea Trial shall be carried out in Hong Kong in the presence of the GNC officers or consultants and the HKPF representative.

(b) Official Sea Trial Programme

The Contractor shall submit an Official Sea Trial programme for GNC approval, at least fifteen (15) working days in advance of the Official Sea Trial, which shall include details of proposed procedures for carrying out the Official Speed Trial, Endurance Test, Manoeuvring Test, Steering Test, Heeling Test at a Turning Speed, Crash Stop Test, Astern Running Test, Emergency Steering Test, Anchoring Tests and other tests stated in this Paragraph1.8.2.

The Official Sea Trial programme shall be written in accordance with RO Requirements and requirements set out in this Part VII, making reference to international standard such as ISO 19019-2005: Sea-going vessels and marine technology – Instructions for planning, carrying out and reporting sea trials. Documentary evidence acceptable to the Government showing that the Vessel is safe to go to sea for the intended tests and trials specified in the Contract shall be submitted together with the aforesaid programme (including the inclining experiment report as mentioned in Paragraph 3.3.4 of this Part and approved by the RO).

(c) Costs and expense for carrying out tests and trials

As in all other tests and trials to be conducted for the Vessel acceptance, the Contractor shall be required to carry out the Official Sea Trial in Hong Kong at its own expense (including but not limited to the expense of fuel, lubrication oil, crew and other necessary expenses). Before the Official Sea Trial, the Contractor shall observe the certificate of competency and third party insurance requirements under the Laws of Hong Kong.

(d) Contractor's staff onboard the Vessel during the trial

To ensure that the Official Sea Trial can be conducted safely and in accordance with the Laws of Hong Kong, the Contractor shall provide GNC with appropriate details about each one of the Contractor's staff who will be onboard. These details shall include the name, post, duty, experience and certificate(s) of competency to be submitted at the same time as the Official Sea Trial Programme specified at Paragraph 1.8.2(b) of this Part VII. The number of persons onboard during a particular test or trial shall be agreed by the GNC officers and HKPF representatives. The location of each person onboard, which can affect the centre of gravity of the Vessel under trial, shall also be first agreed by the GNC officers and HKPF representatives and shall be weighted and recorded.

(e) Loading conditions for all tests and trials of the Official Sea Trial

The loading conditions to be used during all tests and trials are listed in Annex 5 to this Part VII and as summarised below:

Conditions at all tests & trials		
1	Person onboard	5 Persons (at 92.5 kg per person including effect)
2	Fuel oil tanks	Depends on loading conditions
3	Fresh water tank	Depends on loading conditions

4	Store/Utilities	Depends on loading conditions
5	Sea Conditions	Sea state 0-2 : wave height 0.1 - 0.5 metres

All loading conditions being used during the Official Sea Trial shall be complied by using the approved final lightship weight and centre of gravity. All such loading conditions shall meet the intact and damage stability criteria as specified in Paragraphs 3.3.9 and 3.3.10 of this Part VII. Other documentary evidence acceptable to the Government showing that the Vessel is safe to go to sea for the intended tests and trials specified in the Contract shall be submitted.

(f) System Inspection Test

The Contractor shall propose and demonstrate to the GNC and HKPF representatives a test protocol to fully demonstrate that the Vessel, the outfitting, machinery, electrical and electronic systems are in complete condition and good working order. This shall include, but not be limited to:

(1) Start test for the main diesel engines, diesel generators and related equipment;

(2) An anchoring test to meet the RO requirements;

(3) A noise emission test to confirm compliance with the requirements stipulated in Paragraph 4.1.15(a)(3) of this Part VII;

(4) A megger test as stipulated in Paragraph 8.3.7 of this Part VII; and

(5) Other tests required by the RO, GNC, HKPF, COMMS or their appointed representatives.

(g) Official Speed Trial

As part of the Official Sea Trial, the Contractor shall carry out the Official Speed Trial to determine whether the Vessel, powered by the main propulsion engines and the waterjet system as per Paragraph 2.3 of this Part VII, can achieve the Contract Speed in Hong Kong. The Contractor shall carry out the Official Speed Trial in the presence of GNC officers, HKPF officers and/or the appointed consultant(s).

(1) The Official Sea Trial shall be carried out in Hong Kong waters under the conditions specified in paragraph 1 of Annex 5 to this Part.

(2) The Official Speed Trial shall be carried out referring to international standards, such as ISO 15016:2015 - Ships and Marine Technology - Guidelines for the assessment of speed and power performance by analysis of speed trial data, to the satisfaction of GNC.

(3) The actual mean speed of the Vessel (i.e. NOT theoretical) shall be measured during the Official Speed Trial runs to determine if the Contract Speed can be achieved. The speed calculations must NOT be corrected by wind, wave, tidal current, shallow water effects and weather conditions.

(4) The actual mean speed shall be calculated as the arithmetic mean of not less than FOUR (4) continuous runs, i.e. TWO (2) runs in each direction. The speed for each run shall be calculated by measuring the time of the Vessel running for one nautical mile by a measuring method acceptable to GNC.

(5) The speed for each run shall be measured by the instruments provided either by:

(i) The Contractor, on the condition that the instrument has been calibrated by a certified body recognized and acceptable to GNC and HKPF with calibration certificate issued no earlier than twelve (12) months prior to the Official Speed Trial; or

(ii) Global Navigation Satellite System ("GNSS") supplied by the Government; or

(iii) The GNS or Differential Global Navigation Satellite System ("DGNSS") which is properly calibrated (with supporting calibration documents), installed onboard the Vessel, and is acceptable to GNC and HKPF; or

(iv) Other speed measuring methods acceptable to GNC and HKPF.

(6) The Contract Speed is considered not achieved if the Contract Speed cannot be attained during the Official Speed Trial if a minimum of two (2) sets cannot achieve the Contract Speed out of a maximum of FIVE (5) sets with each set comprising two (2) runs (in opposite directions).

(7) The Contract Speed stated in Paragraph 2.3 shall be achieved by the Vessel in the Official Speed Trial Conditions, as specified in Annex 5 to this Part VII, with the engine power at the declared 95% Maximum Power ("MCR"). The Contract speed shall be calculated from the highest mean speed between to-and-from directions of the runs. If the Vessel fails to achieve the minimum Contract Speed, the Government will deem that the Vessel has failed to pass the Official Sea Trial whereupon the Government shall have all rights as specified in Clause 12.6 of Part IV.

(8) All Equipment shall also be in operation during the Official Sea Trial unless explicitly exempted by GNC or HKPF.

(9) The Vessel must be in the trial conditions (see paragraph 1 of Annex 5 to this Part for the conditions of the trials) during the Official Speed Trial. All Equipment shall also have passed all tests and trials in Stages 1 and 2 of the Technical Acceptance and which operation shall not be affected during the Official Sea Trial.

(10) The speed, time of the day, engine running conditions, sea condition, etc., shall be properly recorded by the Contractor, and signed as witness by GNC surveyor (or GNC representatives) during the Official Sea Trial. A copy of the Official Sea Trial Report as required in sub-paragraph (r) below shall be given to GNC before Delivery Acceptance.

(h) Endurance Test

The Endurance Test shall be carried out for different engine loadings and speeds to obtain the speed / fuel consumption curves (or tabulated data) for the Vessel, with the engine(s) operating within the manufacturer's recommended engine operating conditions. The test results shall be recorded in accordance with the requirements stipulated in Annex 6 to this Part VII. The report submitted shall include a curve or curves showing ship speed versus propulsion engine(s) rpm and power, with particulars of the Vessel loading and displacement during the test(s).

(i) Manoeuvrability Test

Forward turning circle tests to port and starboard sides shall be carried out with:

(1) All main propulsion engines running; and

(2) Any one main propulsion engine running on its own.

The minimum time for turning to both sides through heading changes of 15°, 90°, 180°, 270°, and 360° shall be recorded.

(j) Heeling Test at a Turning Speed

The Test shall determine the heeling angle during turns for different Vessel speeds with a turning radius of five (5) ship lengths. The Vessel shall be tested at a constant speed in a straight course and turn at a turning radius of not greater than five (5) ship lengths with the same engine RPM for both port and starboard turns. The corresponding heeling angle and

engine RPM shall be recorded. This test shall be repeated for different forward speeds from twenty (20) knots to forty-five (45) knots with intervals at every five (5) knots.

The test shall not be continued any further when the corresponding heel angle is equal to or greater than ten (10) degrees or the vessel presents a dynamically unstable behaviour. The corresponding Vessel speed and engine RPM shall be recorded.

(k) Steering Test

The steering and reversing performance of the waterjet system shall be tested to meet the RO and manufacturer requirements.

(l) Crash Stop Test

This Test shall determine the minimum time and distance required for the Vessel to move from running full ahead to stopping and then to full astern, without any damage being caused to the engines or any risk posed to the crew. The results shall be recorded.

(m) Astern Running Test

This Test shall determine the maximum astern running speed achievable by the Vessel. The result shall be recorded.

(n) Emergency Steering Test

This Test shall be carried out to confirm that the Vessel can be steered satisfactorily when the electrical power supply to the steering system has been disabled. The result shall be recorded.

(o) Operational Systems Test

All Operational Systems shall be tested as per Chapter 9 of this Part VII under Stage 2 of Technical Acceptance – Official Sea Trial.

(p) Hull Bottom Inspection

Upon successful completion of the Official Speed Trial in Hong Kong, the Contractor shall arrange with GNC officers to carry out a hull bottom inspection on the Vessel to check for any hull damage before delivery. Any hull damage found shall be rectified to the satisfaction of GNC before the Vessel can be accepted.

(q) The Contractor shall re-perform the tests and trials as mentioned in this Paragraph 1.8.2 above as part of Stage 2 of the Technical Acceptance even if these tests have already been performed as part of Stage 1 of the Technical Acceptance. If these tests and trials are not passed under Stage 2 of the Technical Acceptance, the whole of the Technical Acceptance shall not be deemed to have been successfully completed.

(r) Submission of Official Sea Trial Report

The Contractor shall provide an Official Sea Trial Report, written in accordance with RO requirements and applicable International standards, acceptable to GNC. The Report shall contain, but not be limited to the speed, engine/waterjet system and auxiliary engine(s) running conditions, vessel load (fuel and water) conditions, heeling conditions, performance data sought by respective tests or trials, time of day, weather, wind and sea conditions, which will be witnessed and signed by the GNC surveyor (or the GNC representative) and the HKPF representative during the Official Sea Trial. The Official Sea Trial Report shall be submitted to GNC before Delivery Acceptance.

1.8.3 Stage 3 of Technical Acceptance – Operational System Acceptance

(a) The Contractor shall re-perform the tests as mentioned in this Paragraphs 1.8.3(b) and 1.8.3(c) below as part of Stage 3 of the Technical Acceptance even if these tests have already been performed as part of Stage 1 or Stage 2 of the Technical Acceptance. If these

tests are not passed under Stage 3 of the Technical Acceptance, the whole of the Technical Acceptance shall not be deemed to have been successfully completed.

(b) The Contractor shall under this Stage 3 of the Technical Acceptance carry out the bench acceptance test and on-site commissioning test for Operational Systems as mentioned in Chapter 9 of this Part VII, and all other verification tests to determine whether or not the Vessel including the Equipment has been supplied in accordance with all the specifications set out in this Part VII.

(c) All Operational Systems and their installations shall be approved and inspected by COMMS as part of the Operational System Acceptance.

(d) The Contractor shall supply all necessary equipment and labour at its own cost for carrying out the tests and trials stated in Paragraphs 1.8.3(a) to 1.8.3(c) of this Part VII.

(e) If the Vessel cannot pass all of the tests and trials comprising the Technical Acceptance (viz., all tests and trials as set out in Paragraphs 1.8.1 to 1.8.3 of this Part VII) by the Delivery Date specified in the Contract, the options available to the Government are set out in Clause 12 of Part IV, the Conditions of Contract, and other applicable provisions of the Contract.

1.8.4 Delivery Acceptance

(a) The Vessel, after its successful completion of all Stage 1 to 3 as mentioned in Paragraphs 1.8.1 to 1.8.3 above (collectively, "Technical Acceptance"), shall be delivered at the Contractor's expense to the Government Dockyard. If there is any delay in the delivery of the Vessel in Ready to Use condition for more than 120 days after the scheduled Delivery Date specified in Schedule 2 of Part V, at the discretion of the Government, the Contract may be terminated according to the applicable terms stipulated in the Contract.

(b) All Deliverables including all Documentation, all Spare Parts and all Warranty Spare Parts required prior to and at the Delivery Acceptance shall all be delivered in accordance with Paragraph 10.2 of this Part VII.

(c) The Contractor must provide fourteen (14) days' advance notice, in writing, when the Vessel is considered completed in accordance with the Contract and Ready for Use and is ready to be delivered for the Delivery Acceptance. The Government will not accept delivery if, after undergoing the tests and trials in the Technical Acceptance, the Government does not consider that the Vessel is in a Ready to Use condition.

(d) Not later than six (6) weeks before the Delivery Acceptance of the Vessel, the Contractor is required to submit to GNC four (4) copies of the Inventory List covering all items of or relating to the Vessel including all engines, on board equipment, manuals, documentation, spares, stores, and equipment for testing in respect of the entire Vessel. The Inventory List shall be approved by GNC seven (7) days before the day of Delivery Acceptance and covers everything which the Contractor is required to deliver under the Contract. At the Delivery Acceptance of the Vessel, the approved Inventory List will be used to check that all the items have been delivered to GNC and in case of the Warranty Spare Parts, have been delivered to the Contractor's local agent in a satisfactory state. Details of each inventory item shall include: item name, description, type, quantity, manufacture's name and contact details, part reference number and/or serial number, and the items' locations in the Vessel.

(e) The items specified in Paragraph 10.2 of this Part VII, all items listed in Annex 7 to this Part VII, all items set out in the Inventory List in the form as approved or stipulated by the Government, and all other items which are required to be delivered under this Part VII as part of the Delivery Acceptance shall be delivered to GNC as part of the Delivery Acceptance of the Vessel.

(f) During the Delivery Acceptance, the Contractor must demonstrate to GNC that all hull construction, outfitting, machinery, electrical and electronic equipment are in good working order, and must hand over the Vessel, its fixtures and Equipment to GNC in good and complete condition.

(g) On delivery, the Vessel must be in a clean, tidy, fully fitted and operational condition to the satisfaction of GNC.

(h) Aside from passing the Technical Acceptance and the Delivery Acceptance, the full Classification Certificate with notations for the Vessel as per Schedule 9 of Part V shall be issued by the relevant RO as specified in Paragraph 2.2.3 of this Part VII before the Government will issue the Acceptance Certificate.

(i) The Delivery Acceptance of the Vessel shall be carried out by GNC in accordance with the terms stipulated in the Contract. The Delivery Acceptance is only completed once the Director of Marine has issued the Acceptance Certificate.

1.9 Warranty Services During the Warranty Period

1.9.1 Notwithstanding and without prejudice to the Contractor's obligation to provide the Warranty Services for the Vessel under the Conditions of Contract, the original copy of the manufacturer's warranty certificates and all related manuals and documents in respect of all the Equipment, valid for Twelve (12) months from the date of Acceptance Certificate of the Vessel, shall be delivered to GNC upon Delivery Acceptance.

1.9.2 The full scope of Warranty Services is set out in Annex 1 to this Part VII.

1.9.3 The Contractor is responsible for arranging the Vessel for Guarantee Slipping at the end of the 12-month Warranty Period. In addition to any defects which the Contractor may be required to fix as part of the Warranty Services as stated in Annex 1 to this Part VII, the Contractor shall also be responsible for the rectification of any defects found in the course of Guarantee Slipping. The full scope of the Services to be provided as part of the Guarantee Slipping is set out in Annex 1 to this Part VII.

1.10 Support Services

1.10.1 The Vessel shall be designed for through life support and easy maintenance in the HKSAR based on the operational profile and minimum life expectancy as specified in this Part VII.

1.10.2 The above also applies to the main engines, generators, gearboxes, waterjets (if any), as well as all other equipment installed in the Vessel. Support and maintenance services shall be available (i.e. serviceable) in Hong Kong in respect of all equipment installed in the Vessel and return of the whole or part of the Equipment to the original place of manufacturer or supplier shall not be necessary in order to carry out any repair work.

1.10.3 The Contractor shall provide a whole life support plan for the timely procurement of spare / replacement parts and the undertaking of preventative maintenance with the Vessel as specified in Paragraph 10.2.3 of this Part VII.

1.11 Asbestos Free

1.11.1 The Vessel must not contain any asbestos or asbestos containing materials. The Contractor must comply with Hong Kong Air Pollution Control Ordinance (Cap. 311), Part X. The Contractor shall engage a service provider approved by one of the RO's or other entities acceptable by GNC to verify that there is no asbestos on the Vessel. An asbestos free certificate or statement of

compliance issued by the service provider to this effect shall be provided upon delivery of the Vessel.

Chapter 2 General Technical Requirements

2.1 Introduction

2.1.1 Without prejudice to the generality of Chapter 1 of this Part VII, this Chapter contains the more particular technical specification for the Vessels. The significance of Essential Requirements **[E]** is explained in Paragraph 1.1 of this Part VII.

2.1.2 The work to be done under this Contract consists of the design, construction, outfitting, testing and delivery of twelve (12) MPL for HKPF. Workmanship, functions, characteristics and performance shall be in accordance with this Part VII, best marine construction practices, and the regulatory standards herein specified or otherwise applicable.

2.1.3 The Contractor shall exercise its professional expertise and knowledge to come up with an appropriate design for the Vessel, which can comply with all requirements of the Contract. The Conceptual General Arrangement Plan ("Conceptual GA Plan") at Annex 10 to this Part VII serves only as a set of reference drawings to assist in illustrate how the tender requirements stated in this Part VII could be complied with, and is by no means a mandatory design layout of the Vessel. The Tenderer's tender would not be disqualified for not complying with the Conceptual GA Plan provided all essential requirements are complied with.

2.1.4 During the design and construction of the Vessel, the Contractor shall submit a detailed General Arrangement Plan ("GA Plan") and all other construction drawings for GNC approval and acceptance.

2.1.5 The design of the hull form for the offered Vessel shall be either one of the following: **[E]**

(a) The same as the design of any other existing monohull vessel, whether designed and built or just built by the Tenderer or another person, where the proposed hull form for the offered Vessel shall have the same principal dimensions of the hull including length, breadth and depth, and the same hydrostatic particulars and hull characteristics as that existing monohull vessel ("existing monohull"). The existing monohull with waterjet propulsion system shall be in compliance with the Contract Speed requirements in Paragraph 2.3 of this Part VII. **[E]**

(b) A design with modifications from the design based on an existing monohull vessel with a length of the hull between eighteen (18)m and twenty (20)m (both figures inclusive) with similar hull characteristics of the offered hull form ("existing monohull"). The design with modifications shall meet the Contract Speed requirements specified in Paragraph 2.3 of this Part VII. Whilst the Government reserves the right to ask for submission if found missing in the tender after the Tender Closing Date, the Tenderer shall prove that the modified design comply with the Contract Speed requirements as aforesaid by either through the provision of the corresponding model test report or the corresponding report of Computational Fluid Dynamics ("CFD") calculations. In case with model test report, it shall be in relation to a model test conducted no earlier than sixty (60) months preceding the Original Tender Closing Date at an International Towing Tank Conference ("ITTC") member's establishment as at the date of the test report. The test report shall confirm the ship resistance, Contract Speed and powering of the Vessel and shall have confirmed that the model vessel with the modified design complies with the ITTC requirements. **[E]**

2.1.6 All the machinery, waterjet system, equipment and facilities, furniture, fixtures and fittings, including outfitting of the Vessel that are described in this Part VII, together with their requirements for design and installation standards that are stipulated in this Chapter 2 and in any other parts of this Part VII, are the items that must be included in the complete "As-built" Vessel delivered to the Government.

2.2 Rules and Regulations

2.2.1 The Vessel shall be designed and constructed in accordance with the rules and regulations of the RO specified in Schedule 9 of Part V in the version as at the Contract Date unless the rules and regulations of the RO specify that version of such rules and regulations as at the keel laying date of the Vessel shall apply in relation to the relevant requirements specified therein. The hull (including equipment) and machinery (including electrical installations) of the Vessel shall be assigned with appropriate class notations in the certificate of classification to be issued by the RO upon completion of the Vessel, which class notation as proposed in Schedule 9 of Part V shall meet the requirement specified in this Part VII. The Tenderer shall state in Part V, Schedule 9, which RO (to be selected from the definition of "Recognised Organisation" in Clause 1.1 of Part IV (which is repeated in Annex 9 to this Part VII) and its rules and regulations and what class notations that will be used in the design and construction of the Vessel.

2.2.2 The Contractor shall design, build and supply the Vessel in full compliance with the requirements given in this Part VII which, to that extent, may be over and above what is normally required by any statutory and RO rules and regulations. Should there be any contradiction between the rules and regulations of the RO and this Part VII, the final decision shall be vested in the Government.

2.2.3 The Vessel is required to be issued with full certificate of classification (without conditions) with notations as set out in Schedule 9 of Part V by the RO. All plans, particulars and documentations which are required for the classification of the Vessel, in addition to those listed in Annex 3 to this Part VII shall be approved by the RO before submission to GNC for endorsement and final approval prior to commencement of work. Any subsequent modifications or additions are to be treated in the same manner.

2.2.4 The Vessel shall be with class notations which is suitable for "Statement of Purposes of the Vessel" as stated in Paragraph 1.2 of this Part VII.

2.2.5 Without prejudice to the general requirement that the Contractor shall perform all Work in full compliance with all applicable laws and regulations and in full compliance with the requirements of the Contract including this Part VII, the construction of the Vessel must comply with the requirements of the RO specified in Schedule 9 of Part V. This is unless where it is expressly stated that any other RO as listed below (which list is repeated in Annex 9 to this Part VII) other than the RO specified in Schedule 9 of this Part VII may apply. There may also be other requirements further specified in sub-paragraphs (j) to (o) below which are also applicable. In each of the aforesaid cases, the version as at the Contract Date shall be applicable unless any of these requirements specifies that version of requirements as at the keel laying date of the Vessel.

(a)	American Bureau of Shipping	ABS
(b)	Bureau Veritas SA	BV
(c)	China Classification Society	CCS
(d)	DNV AS	DNV
(e)	Korean Register	KR
(f)	Lloyd's Register Group Limited	LR
(g)	Nippon Kaiji Kyokai	NK
(h)	RINA Services S.p.A.	RINA
(i)	Russian Maritime Register of Shipping	RS

And other entities and regulations as specified below:

(j) International Electrotechnical Commission ("IEC") Regulations for the electrical and electronic equipment;

(k) International Telecommunications Union Recommendations in the International Radio Regulations ("ITU-R");

(l) Quality and standards of the welding shall comply with the rules of the RO or American Welding Society ("AWS") or other applicable international standards or rules acceptable by GNC;

(m) International Regulations for Preventing Collisions at Sea 1972, and all the effective Resolutions by the International Maritime Organization ("IMO");

(n) International Code of Safety for High Speed Craft, 2000 ("IMO 2000 HSC Code" or "2000 HSC Code") and other applicable IMO regulations;

(o) All applicable Hong Kong laws and regulations including the applicable Code(s) of Practice as from time to time published on the website of the Marine Department ("COP");

(p) All other conventions, laws, regulations, guidelines and codes as mentioned in this Part VII;

(q) All equipment/fittings shall be designed and manufactured to at least the standards as specified in these Technical Specifications. When none of the rules and regulations in Paragraphs 2.2.5(j) to (p) above are applicable, then the applicable standards as specified by the applicable organizations below shall be complied with:

BSI	British Standards Institute
GB (or SAC)	Standardization Administration of the People's Republic of China
IEEE	Institute of Electrical and Electronic Engineers
ISO	International Organization for Standardization
JIS	Japanese Industrial Standards

In the event of any inconsistency among the above requirements, rules and standards, those mentioned in sub-paragraphs (j) to (n) shall prevail over the requirements of the relevant RO as listed in sub-paragraphs (a) to (i) above.

2.3 Contract Speed

2.3.1 The Contract Speed of the Vessel, when propelled by all main diesel engines each running at its 95% maximum power ("MCR"), together with the waterjet propulsion system, shall not be less than forty-five (45) knots, when running under the conditions of WMO Sea State Code 0 to 2 and under the loading and test conditions more particularly described in Annex 5 to this Part VII and further observing the requirements specified in Paragraph 2.3.2 of this Part VII. **[E]**

2.3.2 The Contract Speed prescribed above shall be achieved without porpoising, or other dynamic instabilities. The waterjet propulsion system shall match the engine profile and avoid cavitation when the Vessel operates at the full Contract Speed as mentioned in paragraph 2.3.1 above.

2.3.3 The Vessel shall also be designed for cruising and loitering operations during which all engines operate continuously, at the following Vessel speeds:

95% MCR Trials Load running speed:	45 knots
Cruising speed:	15 knots
Loitering speed:	5 knots

2.4 Principal Dimensions

2.4.1 The Vessel shall comply with the following:

Length Overall (LOA):	Between 18 and 20 metres. (Fenders Included)	**[E]**
Breadth (B):	≤5.5 metres. (Fenders included)	**[E]**
Depth (D):	Designed to suit	
Maximum Draught(T):	Designed to suit	
Air Draught:	Designed to suit	

"Length Overall" means the distance between the foreside of the foremost fixed permanent structure and the aft side of the aftermost fixed permanent structure of the Vessel (transom) including fenders, but does not include the waterjet system and out-fittings. The Tenderer shall indicate the Length Overall of the Vessel in dimensional scale in the Preliminary General Arrangement Plan submitted according to Schedule 7 of Part V.

2.5 Material of the Structure

2.5.1 The Vessel shall comply with the following:

Material of the Hull structure:	Marine grade aluminium alloy	**[E]**
Material of the Superstructure:	Marine grade aluminium alloy	**[E]**

2.6 Propulsion System

2.6.1 Two (2) or Three (3) waterjet propulsion units shall be driven by two (2) or three (3) marine diesel engines. The propulsion systems shall be identical from the same manufacturer, and of the same model and deliver the same horsepower and have all other specifications identical with each other. **[E]**

2.7 Vessel Operating Profile and Environment

2.7.1 The Vessel, operated by the HKPF for the purposes as listed in Paragraph 1.2.1 of this Part VII, shall be designed and built to have the capability to operate in the Hong Kong Waters. **[E]**

2.7.2 The Vessel shall comply with the following operational profile: **[E]**

Engine Power 95% MCR:	4 hours/day
Engine Power 20% MCR:	14 hours/day
Total number of navigation hours/day:	18 hours/day (summation of the number of hours as above-mentioned)
Number of days/year:	280 days/year
Endurance for fuel capacity:	16 hours without the need for refuelling (For the calculation purpose, 4 hours within the 16-hour period will be at 95% MCR, whilst the remaining period will be at loitering speed).

2.7.3 The Vessel shall be designed for deployment by the HKPF for all of the following operating configurations:

(a) Patrol Configuration:

(1) Carries 5 crew;

(2) Full Contract Speed of 45 knots at 95% of MCR): 4 hours/ day;

(3) Loiter (about 5 knots or 20% MCR): 14 hours/ day; and

(4) Tied up at berth: 6 hours/ day;

(b) Officer Conveyance Configuration:

(1) Carries 5 crew and 16 police officers;

2.7.4 Typhoon Mooring Configuration:

(a) Carries 5 crew;

(b) Cruise speed (15 knots) to mooring location: 0.5 hours; and

(c) Stay on mooring, generator running: 24 hours x maximum of 2 days.

2.7.5 The Vessel shall be capable to operate safely within Hong Kong Waters in weather conditions up to and including the conditions equivalent to WMO Sea State 4 and Force 5 on the Beaufort Wind Force Scale. It must be capable of surviving and returning to the base, if caught offshore within Hong Kong Waters by weather conditions equivalent to Force 7 on the Beaufort Wind Force Scale and Sea State 6. Reference shall also be made to Paragraph 3.3.5 of this Part VII for details.

2.7.6 Ambient Conditions - All machinery, equipment, systems shall be capable of operating at their full design performance under the following environmental conditions:

External air	0 to +40°C
Internal air	0 to +35°C
Machinery space	+ 45 ºC (All equipment at full rated power)
Maximum seawater temperature	+ 32 ºC

2.8 Markings and Colour Scheme

2.8.1 The marking and colour scheme for the Vessel shall be in accordance with the requirements given in this Part VII.

2.8.2 The Contractor shall provide the markings and colour scheme for the Vessel, which shall be in accordance with the requirements given in this Part VII. The colour scheme shall be approved by GNC before application. All painting colour schemes for fittings shall be agreed by GNC.

2.8.3 All labelling shall be in both Traditional Chinese and English and as per applicable rules and regulations.

2.8.4 The Vessel's name shall be marked permanently and painted on both sides of the deck house and bow and at the transom centre to GNC and HKPF's satisfaction. Draught marks shall also be marked on both sides of the bow and stern in the same manner as the Vessel name. The full load design draught mark shall be marked port and starboard amidships to the satisfaction of the RO and GNC.

2.8.5 All labelling, stencilling and marking (not limited to the hull but including all aspects of the Vessel) shall be made on separate plaques, boards, or labels attached to the structure. By default, all displays, control actuators, electric switches, valves, and other equipment shall be labelled to

indicate their type and function as appropriate.

2.8.6 Exits shall be identified, labelled and supplemented by reflective direction signs. In addition, emergency escape lights shall be installed in cabins/ compartments. Stowage locations for Life Saving Appliances ("LSA") including but not limited to life jackets and quantities of life jackets shall be identified as per the requirements specified under the International Convention for the Safety of Life at Sea ("SOLAS") regulations.

2.8.7 Fire-fighting equipment is to be identified and labelled as per the requirements specified under the SOLAS regulations.

2.8.8 Trip hazards shall be avoided aboard the Vessel as much as possible and, otherwise, shall be appropriately marked.

2.8.9 The fender shall be black in colour.

2.8.10 The hull shall be antifouled below the waterline and the antifoul shall be compliant with the International Convention on the Control of Harmful Anti-fouling Systems on Ships, 2001 ("AFS Convention").

2.9 Tally Plates

2.9.1 The following information shall be displayed on the builder's plate.

(a) Builder's name;

(b) Vessel's name;

(c) Year of build; and

(d) Maximum number of persons including the crew that the Vessel is designed to carry.

2.9.2 Tally plates in both English and Traditional Chinese characters shall be fitted for all spaces and all equipment as required by GNC including but not limited to:

(a) Equipment contained within consoles;

(b) Electrical and communications equipment;

(c) Air vents and filling pipes for fuel oil tanks;

(d) All valves and equipment on deck;

(e) Control panels, switchboards, distribution boxes and electrical circuits; and

(f) Any other equipment/fitting as required.

2.9.3 Information engraved on the tally plates shall include: service, function, mode of operation, source of power, fuse rating, voltage, warning and other information as required by GNC.

2.9.4 All cable terminations shall be identified clearly for disconnection and reconnection purposes.

2.9.5 Tally plates exposed to the weather shall be made of durable and weatherproof material and be securely fastened.

2.9.6 List of tally plates shall be provided to GNC for approval.

2.10 Other Design Features

2.10.1 The berthing requirement of the Vessel shall match the designated points of berth at the Government Dockyard and at the HKPF's operational bases. Details will be addressed in kick-off meeting.

2.10.2 A permanent list is not allowed, and where it is not practical to achieve this requirement, the maximum permanent list of the Vessel in its lightship condition must not be greater than 0.5 degrees.

2.10.3 The use of permanent ballasts on the Vessel shall only be used as agreed by GNC.

2.10.4 The Vessel shall be free of unacceptable structural vibrations and free of excessive porpoising at all speeds so that there is no loss of directional control.

2.10.5 Both air and structurally induced noise shall be kept to a minimum level in the wheelhouse and accommodation areas in accordance with the IMO 2000 HSC Code.

2.10.6 The Contractor shall request the RO to carry out a measurement of the Vessel's Gross Tonnage ("GT") and Net Tonnage ("NT"), as defined in the International Convention on Tonnage Measurement of Ships 1969. A statement of compliance for the Vessel stating the measured GT and NT together with the calculation details shall be issued by the RO, and submitted by the Contractor to GNC for recording purposes.

2.11 Failure Mode and Effect Analysis – ("FMEA")

2.11.1 A comprehensive, systematic and documented investigation (Failure Mode and Effect Analysis – "FMEA") shall be conducted to establish the important failure conditions of the Vessel and to assess their significant effect with regard to the safety of the Vessel, its occupants and the environment as required. The effect of any likely failure in handling and control devices, services or components shall be assessed to maintain at a safe level of craft operation. FMEA shall include but not be limited to the following:

(a) Machinery system and their associated control; and

(b) Directional control system.

The Contractor shall submit a FMEA report regarding evaluation, identification, analysis, verification trial and test, recording the test results and submission of relevant document in various stages for critical systems. The FMEA report shall be in accordance with the IMO 2000 HSC Code, in the version as at the Contract Date unless it specifies that version as at the keel laying date of the Vessel shall apply in relation to the relevant requirements specified therein, and submit to the RO for approval before sending to GNC for acceptance. FMEA conclusion trial shall be conducted and verified in the presence of the RO.

Chapter 3 Hull and Deckhouse/Wheelhouse

3.1 General Requirements

3.1.1 The Vessel shall be designed and built with a mono-hull form, with the hull structure and the superstructure to be constructed of marine grade aluminium alloy. All materials shall be new and of a type which has been certified by the RO or other entities acceptable to GNC for shipbuilding purposes. Building processes for construction shall comply with an approved standard. Their selection shall recognize the Vessel through life cycle and service conditions for ease of repair in the event of hull damage.

3.1.2 The design stress and load (wave height versus speed), maximum acceleration considered and scantlings calculation including the internal structural members shall be approved by the RO before submitting to GNC for approval.

3.1.3 The hull structure design loads shall be in accordance with the Vessel operational profile and other applicable requirements.

3.1.4 Copies of up-to-date records of structural materials used for the construction of Vessel shall be provided to the RO surveyor and the GNC's representative for inspection during the construction stage of the Vessel. Stowage and handling of materials are to be recorded, including construction materials, welding wire and consumables. Aluminium material storage and construction are to be carried out in an entirely separate space (shed/workshop/building) from the steel material storage / construction area.

3.1.5 The Contractor shall carry out quality control throughout the construction of the Vessel to the satisfaction of GNC.

3.1.6 Strength shall be maintained by ensuring hull structural continuity of main members including bottom girders, deck girders and transverse web frames. Where the strength of a main structural member is impaired by cuts or interruptions in continuity, efficient means of compensation shall be fitted. Special care shall be given to reinforcing the hull in the way of fenders and areas likely to experience slamming.

3.1.7 Major penetrations or access openings through the transverse hull bulkheads below the main weather deck level shall be avoided as far as possible. Cable penetrations shall be located as high and as far inboard as possible. Any openings and all penetrations through bulkheads below the main deck shall be fitted with RO approved devices and be so arranged to ensure the bulkheads are to be entirely watertight and their strength is maintained. All watertight bulkheads shall be permanently marked "WT BHD" in a conspicuous position as agreed by GNC.

3.1.8 The number of openings in watertight bulkheads is to be reduced to the minimum compatible with the design and proper working of the ship. Where pipes, scuppers, electric cables, etc., are carried through watertight bulkheads, arrangements are to be made to ensure the watertight integrity of the bulkheads. Valves not forming part of a piping system are not to be permitted in watertight bulkheads. Lead or other heat-sensitive materials are not to be used in systems which penetrate watertight bulkheads. Where pipes, scuppers, electric cables, etc. are carried through watertight divisions, the arrangements for creating a watertight penetration shall be of a type which has been prototype tested under hydrostatic pressure equal to or greater than that required to be withstood for the actual location in the vessel in which they are to be installed. The test pressure shall be maintained for at least 30 min and there must be no leakage through the penetration arrangement during this period. The test pressure head shall be 10% greater than that determined from the minimum permissible height of a downflooding opening. Where a ventilation trunk forms part of a watertight boundary, the trunk shall be capable of withstanding the water pressure that may be present taking into account the maximum inclination angle allowable during all stages of flooding. The water-tightness inspection methods for the pipelines,

cables, etc. passing through the cabin, need to be approved by GNC and HKPF at the kick-off meeting. The openings in watertight bulkheads shall be approval by RO for the test and method..

3.1.9 Any opening in the hull and the deck shall comply with the RO's rules for watertight integrity if not otherwise specified by GNC or HKPF at the kick-off meeting.

3.1.10 Close attention shall be paid to the fabrication and installation of machinery foundations to insure rigidity of the foundations and continuity with adjacent structures.

3.1.11 The hull structure shall be arranged to accommodate the Vessel's dry docking and lifting requirements in the Government Dockyard in Hong Kong.

3.1.12 All welding and fabrication shall be carried out according to the rules of the RO to oversee the construction work, and rules from American Welding Society ("AWS") or other international standards acceptable to GNC. The welding scheme, including Welding Procedure Specification ("WPS"), shall be approved by the RO and GNC before work is carried out.

3.1.13 Welded joints shall be carefully designed and constructed to conform to the latest established standards as at the Contract Date to prevent fatigue failure. Cutting for edge preparation shall be performed by qualified person(s) to achieve correct angle, shape and smooth finish of the edges. Only qualified welders shall perform the welding work.

3.1.14 Certification of the qualifications of each individual welder and inspector shall be submitted to GNC by the Contractor before commencement of works. Welds carried out to procedures without approval or by non-certified welders shall be removed and rectified by the Contractor at the Contractor's expense.

3.1.15 The structural fabrication information listed below (but not limited to these items) shall be required to be recorded by the Contractor and submitted to GNC before commencing fabrication:

(a) Inventory of incoming material, consumables, components and machinery;

(b) Traceability procedures for materials together with traceability identification codes which shall be in serial and indexed to the controlled manufacturing procedures;

(c) Lofting, cutting, fitting, welding, forming and dimensions of structural components. Measures shall be taken to avoid deformation of structure during fabrication and welding;

(d) The Contractor shall produce a welding and inspection plan, including Welding Procedure Specification ("WPS"), clearly identifying the procedures to be used as well as the type and extent of the inspection to be carried out on the Vessels' structure and this plan shall be approved by the RO. The plan shall include:

(i) A full length visual inspection of every weld. Additionally, radiographic testing ("RT") is to be carried out on butt welds with the number of radiographs taken being not less than the length of the vessel's hull structure in metres (e.g. for a hull length measuring 19.1 metres, 20 radiographs will be taken). The location of these radiographs shall be determined by the RO with the agreement from the Government's officers or representatives. Alternatively, suitable Ultrasonic Test (UT) can be proposed by the Contractor subject to the agreement of RO and the Government's officers or representatives;

(ii) Additionally, personnel conducting the Non-Destructive Test ("NDT") testing, interpreting and evaluating the results of the tests shall be certified to at least Level II of the American Society for Nondestructive Testing ("ASNT") or an equivalent recognized by the RO. The NDT reports shall be submitted to GNC for record. The details shall be discussed in the kick-off meeting. Records of maintenance and calibration of the welding, machining, measuring and inspection equipment;

(e) Records of machining, finish surfaces, and bolting;

(f) Procedures for work quality non-conformance reporting and records of rectification of

defects; and

(g) The design and manufacturing drawing control procedures, including any revisions and updates and records for any re-issue of drawings.

3.2 Structures of the Hull and Deckhouse/Wheelhouse

3.2.1 General Workmanship

(a) Trunks, coamings, and openings where applicable shall have radius corners as large as possible;

(b) Fittings and openings through decks and bulkheads for pipes and cables shall be properly designed using approved fittings to maintain watertight integrity, reduce transmission of heat, and to minimise transfer of machinery vibration and noise to the hull structure;

(c) Limber and vent holes shall be cut as necessary to ensure proper venting and drainage of all tanks, compartments, pockets, and voids. All tanks shall have limber holes and vent holes of adequate size for full capacity flow to suction and vent lines. There shall be no pockets where water can be trapped at any normal list or trim to be encountered in service; and

(d) Sharp corners shall be avoided.

3.2.2 Tightness

(a) Tanks shall be tested by pressurizing to the equivalent of a head of water from the tank bottom to one (1) metre above the top of the vent loop subject to RO requirements. If pressurized by air, all fittings and welding shall be checked by application of a soap solution. No leakage is permitted. During testing, tanks shall hold their pressure without leakage for six (6) hours;

(b) The weathertightness of any fittings on the weather deck and deckhouse shall be demonstrated by directing a water stream from a 12mm diameter nozzle at an output pressure of 2 bar, from a distance not exceeding 1.5m from the fitting, at all parts of the exterior including all windows, doors and hatches. Any leakage detected shall constitute a failure of the test and corrective action(s) followed by re-test(s) shall be performed;

(c) Chalk tests shall be carried out if the above two methods are not practicable. Prior agreement shall be obtained from the RO and GNC; and

(d) All structures and fittings shall withstand the tests described above and any weakness shall be made good, and at the expense of the Contractor.

3.2.3 Fairness

The hull, decks, and deckhouse side wall shall be fair, and shall be free from objectionable buckles or uneven sight edges. Special care shall be used in aligning and fairing surfaces which are to be joined.

3.2.4 Decks, Platforms, Flats and Stiffness

(a) All decks, platforms and walking flats shall be sufficiently reinforced to prevent deflection that might be caused by service load, an individual walking or standing on the deck and/or by structural flexion of the hull and/or deck house. Structures under or behind fittings shall be adequately strengthened to withstand the load exerted by or on the fittings;

(b) The main deck shall be fitted with watertight flush deck covers for removal of main diesel engines, as well as other equipment, such as the diesel generators, without moving the main diesel engines. The method statements and schematic drawings for major equipment removal arrangement shall be provided and discussed at the kick-off meeting to GNC's

satisfaction; and

(c) Adequately secured gratings shall be provided as required and to GNC's satisfaction. Removable gratings shall be provided where required for access to valves, equipment, bilge pickups, and to other systems below the gratings.

3.2.5 Penetration of Hull Fittings

(a) Penetration of hull fittings, which are required for equipment in this Part VII, shall be located in convenient locations for maintenance purposes. The number of penetration fittings shall be kept to a minimum;

(b) All penetration of hull fittings located below the waterline shall be fitted with shut-off valves fabricated of metal and having suitable corrosion protection, such as cathodic protection. All shut-off valves shall be of a type approved by the RO; and

(c) Where penetrations of hull fittings are located below the waterline, the hull external surface shall be fitted with fairings/screens to minimize the drag. Penetrations of hull fitting are not to protrude beyond the hull bottom plating where possible.

3.2.6 Hull Structural Closures

(a) Inspection cover(s) shall be provided for each fuel oil tank. The inspection cover(s) shall be sized to allow for proper inspection of the entire tank interior. A suitable non-leaking gasket is to be fitted between the tank and the cover. The cover is to be bolted to the tank using stainless steel bolts and self-locking nuts. The arrangement shall be installed to the satisfaction of the RO and GNC;

(b) The arrangement of the deck hatches shall be submitted to the RO and GNC, in advance, for acceptance;

(c) Access to underdeck compartments from the main deck shall be provided by watertight deck hatches;

(d) Flush deck watertight covers fitted with soft patches or gaskets shall be provided for engine and equipment removal or maintenance purposes over the engine room. Soft patches or gaskets shall be secured properly to the satisfaction of GNC;

(e) A minimum of one watertight hinged cover shall be provided for access to and from the main deck to each of the fore peaks;

(f) A minimum of one flush watertight hinged cover shall be provided for access to and from the main deck to each of the engine rooms, the Jet Rooms and Tank Rooms and the other underdeck compartments;

(g) All hinged hatch covers shall be provided with a means to hold them in the fully opened position to avoid person injury during the access in rough seas. A protective measure shall be provided to prevent the crew from accidentally falling into an open hatchway; and

(h) All access closings shall be able to be opened and closed from both sides

3.2.7 Deckhouse/Wheelhouse Closures

(a) Weathertight doors are to be provided for access into the deckhouse/wheelhouse from the aft end with a minimum clear opening to the satisfaction of GNC and HKPF. The weathertight door shall be RO approved;

(b) Doors giving access to the deckhouse/wheelhouse shall have a coaming as per the RO's requirements above the finished main deck surface;

(c) Appropriate locking mechanisms / methods shall be provided for all access door; and

(d) doors in the wheelhouse shall have clear, toughened and laminated safety glass fitted. All windows in the wheelhouse shall be of toughened and laminated safety glass;

(e) Two (2) wheelhouse windows on each side of the vessel shall be able to be opened from inside to a clear opening size which would let an adult swim through.

3.3 Stability

3.3.1 Before the Tender Closing Date, the Tenderer shall submit the tender with a Vessel engineering and stability package that clearly defines the Vessel's performance, structural and operational capabilities viz., covering those items as identified in the table set out in Schedule 7 in Items 7 and 8 about this Paragraph 3.3. The calculations shall be carried out using a proven computer system, with evidence (viz. recognised by a government authority or any one RO listed in Annex 9 to this Part VII). The Contractor shall further develop and refine the above package upon commencement of the Contract as needed and shall seek the written approval of the Government of such revised package.

3.3.2 The Vessel shall comply with the intact and damaged stability requirements stated in Paragraphs 3.3.9 and 3.3.10 of this Part VII as well as with applicable RO requirements.

3.3.3 A final stability assessment of the sea trial loading condition using final lightship data shall be approved by the RO before being delivered to GNC prior to the Official Sea Trial mentioned in Paragraph 1.8.2 of this Part VII.

3.3.4 Inclining Experiment

(a) An inclining experiment shall be carried out to determine the lightship displacement and position of the centre of gravity of the Vessel, in accordance with Chapter 8 and Annex 1 of the International Code on Intact Stability, 2008 (“IMO 2008 IS Code”).

GNC shall have the final decision on whether all Vessels will undergo another inclining experiment in Hong Kong. At the RO’s and/or GNC’s request, the Contractor shall carry out the final inclining experiment in Hong Kong;

(b) At least fifteen (15) working days in advance of the inclining experiment, The Contractor shall submit a "Scheme of Inclining Experiment" which includes:

(1) The proposed date, time, and place for the inclining experiment;

(2) The anticipated water depth at the time of the inclining experiment;

(3) A recent photograph of the site of the inclining experiment;

(4) A recent photograph of the Vessel to be inclined. That includes its external view and hull superstructures and main deck situation;

(5) The name of the RO representative and the name of the Contractor’s representative who will attend and be responsible for the inclining experiment;

(6) The Vessel's intended loading condition with a comprehensive list covering all items with the corresponding weight and centre of gravity locations, which may affect the Vessel's recorded lightship including:

(i) Items which are not fitted onboard, on the date of the experiment, but should be included in the Vessel's lightship; and

(ii) Items which are fitted onboard, on the date of the experiment, but should not be included in the Vessel's lightship.

(7) The proposed initial locations and the subsequent movements of the inclining weights;

(8) The calculation of the estimated heel of the Vessel before and during the inclining experiment;

(9) The proposed number, location and lengths of pendulum used; or other methods of

measuring heel angles (that must be of a type acceptable to GNC);

(10) Hydrostatic table and tank capacity tables. The increment of draft shall be every 100 mm in the hydrostatic table and the increment of sounding shall be every 5 mm in the tank capacity tables;

(11) The list of data to be measured (i.e. drafts, specific gravity of floating water, etc.) in accordance with IMO requirements;

(12) The lightship weight, centres of gravity, the draft, trim and the metacentric heights of the Vessel after each and every shift of inclining weight shall be determined in accordance with IMO requirements applicable to the Vessel; and

(13) The Contractor shall demonstrate the condition for the inclining experiment is stable and safe.

(c) The inclining experiment shall only be conducted:

(1) After the "Scheme of Inclining Experiment" has been approved by the RO and GNC; and

(2) In the presence of the RO and GNC and/or appointed consultant.

A request for attendance shall be made at least five (5) working days in advance. The lightship weight and centre of gravity shall be calculated and presented in the inclining experiment report. All spaces and tanks should be kept dry, or tanks being pressed up with the intended liquid. The free surface of liquids remaining onboard shall be minimised and taken into account.

(d) For the avoidance of doubt, if there is any liquid on board, the worst possible free surface effects of all liquids on board shall be taken into account in all calculations;

(e) The PRELIMINARY Inclining Experiment Report which shall be submitted to the RO and GNC not later than fourteen (14) working days before the Official Sea Trials. This shall include a statement from the Contractor stating that the Vessel is safe to go to sea for the intended tests and trials specified in the Contract;

(f) The FINAL Inclining Experiment Report shall be approved by the RO before submitting to GNC for further comments and acceptance; and

(g) In addition to the above the requirements for conducting and reporting the Inclining Experiment, the Stability Information Booklet shall also follow any specific requirements given in this Part VII.

3.3.5 Stability Information Booklet (Intact and Damage Stability Booklet)

The Vessel shall comply with stability criteria mentioned in this Part VII and other applicable requirement in IMO regulations, including but not limited to the International Code of Safety for High Speed Craft, 2000 (“IMO 2000 HSC Code”). Furthermore, stability due to wind and ship rolling for the required service environment of the Vessel shall be calculated.

In addition to the requirements stated above, the booklet in its final version shall include:

(a) The Vessel's particulars, general arrangement drawing showing all compartments and tank positions, hydrostatic curves (or in table from) and cross curves (or in table from);

(b) Tank calibration / sounding tables including but not limited to fuel oil tank, freshwater tank and black water tank. These tables shall consist of the locations of tanks (in terms of frame numbers), levels from tank bottom, capacity, VCG/LCG/TCG, free surface moments and the location of the sounding points. The trim and heel of the Vessel for which these tables are applicable shall be stated clearly;

(c) Stability calculations for each loading condition shall include but not be limited to a profile

drawing of the Vessel and items of deadweight, lightship, displacement, draughts, trim, VCG, GM (solid and fluid), TCG, LCG, down-flooding angle, GZ curves and values of the stability criteria according to the applicable requirement in IMO 2000 HSC Code;

(d) Any other information as reasonably required by the RO and/or GNC; and the Inclining Experiment Report approved by the RO; and

(e) In the preliminary and final stability calculations, the estimated and final (obtained after conducting the inclining experiment) lightship data shall be used respectively. Both the preliminary and final stability information booklets shall include the following loading conditions under different scenarios as mentioned in the table below for the intact and damage stability calculations and any other loading conditions as may be required by GNC for the purpose of such operation:

Case	Loading Conditions	Fuel Oil (%)	Fresh Water (%)	Black Water (%)	Crew (No. of)	Police Officers (No. of)	Stores/ Utilities (Kg)	Beaufort Scale
1	Lightship	0	0	0	0	0	0	5
2	Full Load Departure	98	98	10	5	16	500	5
3	Full Load Arrival	10	10	98	5	16	500	5
4	Crew Only Departure	98	98	10	5	0	500	7
5	Crew Only Arrival	10	10	98	5	0	500	7
6	Search and Rescue	50	50	50	5	No. of survivors to be determined by Contractor	500	7
7	Crane Lifting Operation	50	50	50	5	16	500	5
8	Maximum Draught Towing	98	98	98	5	16	500	5
9	Minimum Draught Towing	10	10	0	5	0	0	5
10	Intermediate Draught Towing	50	50	50	5	8	250	5

The following notes from (1) to (10) shall be applied to the appropriate loading conditions in the intact and damage stability calculations:

(1) The maximum free surface moment shall be used for calculating the stability of the Vessel in all the above conditions;

(2) The weight of each crew and each police officer is assumed to be 82.5kg with each carrying personal effects of 10kg (for 5 crew and 16 police officers in total);

(3) The VCG of each person, while standing, shall be assumed to be 1000 mm above the deck where they are likely to be situated. The LCG of each person shall be in their most likely position onboard. The likely positions of these persons shall also be agreed by GNC and HKPF;

(4) Heeling due to high speed turning in various loading conditions shall also be considered in the stability calculations with reference to the IMO 2000 HSC Code;

(5) Heeling due to personnel crowding in various loading conditions shall also be considered in stability calculations with reference to the IMO 2000 HSC Code;

(6) An exceptional stability case (case 6) shall be assessed assuming that the Vessel is to recover survivors from the water. In accordance with IMO 2000 HSC Code, the Contractor shall determine the maximum number of survivors that can be safely carried on deck assuming all persons are situated on one side of the Vessel with the

condition specified in the table above;

(7) A passenger heeling calculation shall be carried out for the Search and Rescue condition and shall be included within the Vessel stability booklet;

(8) An exceptional stability case (case 7) shall be assessed assuming that the Vessel will be lifting supplies from the outboard side. In accordance with IMO 2000 HSC Code, the Contractor shall determine that not less than 500 kg of cargos will be lifted from the outboard, assuming the maximum height at which it can be lifted, assuming all persons are situated on one side of the Vessel with the condition specified in the table above;

(9) The stability booklet for the Vessel shall include the loading conditions (case 8-10) when engaged in harbour, coastal or ocean going towing operations for another vessel with similar size and displacement, shall also be considered in the stability calculations with reference to the IMO 2008 IS Code; and

(10) A passenger heeling calculation shall be carried out for the Crane lifting Operation condition and shall be included within the Vessel stability booklet.

The final Intact and Damage Stability Information Booklet shall be approved by the RO before submission to GNC for approval. The Contractor shall supply four (4) copies of the Intact and Damage Stability Information Booklet (as built) to GNC at Delivery Acceptance.

GNC is the ultimate body to give the final acceptance of the Intact and Damage Stability Information Booklet and the Inclining Experiment Report.

3.3.6 The PRELIMINARY Intact and Damage Stability Information Booklet based on the estimated centre of gravity ("CG") positions of the Vessel shall be submitted to GNC during the design stage and within two (2) months after the Contract Date, to show that the Vessel can fulfil the required vessel stability specified in this Part VII as well as any other stability requirements required by GNC to be considered, during the design and construction stage.

3.3.7 The Vessel must not carry any operational limitations with respect to its stability capability within the operational requirements stipulated in this Part VII.

3.3.8 The Official Sea Trial shall only be carried out after the results of the inclining experiment show that the position of the Vessel's actual centre of gravity is consistent with the information given in the PRELIMINARY Intact and Damage Stability Information Booklet, and that the Vessel is safe to proceed with the sea trials.

3.3.9 Intact Stability Criteria

The stability of the Vessel shall show its compliance with the applicable requirements in Annex 8 of the IMO 2000 HSC Code and the IMO 2008 IS Code and the calculations shall be with reference to each set of the loading conditions specified in Paragraph 3.3.5 of this Part VII. **[E]**

3.3.10 Damaged Stability Criteria

3.3.10.1 For the purpose of making damage stability calculations, the volume and surface permeabilities shall comply with the requirements specified in Paragraphs 2.6.2 and 2.6.3 of Chapter 2 of the IMO 2000 HSC Code.

3.3.10.2 The damage stability of the Vessel shall show its compliance for suitable watertight transverse bulkheads shall be arranged to maintain the stability of the Vessel when any one watertight compartment underdeck damaged and flooded. **[E]**

3.3.10.3 The residual stability of the Vessel in the above mentioned damage condition shall be sufficient to maintain adequate stability of the Vessel at sea in any one of operational modes mentioned in the TS.

3.3.10.4 The residual stability of the Vessel shall be considered satisfactory if either (a) or (b) of the

criteria in following are complied with, after taking into account of free surface effects and wind moment, without taking into account the operation of the Gyro Stabilizer (if any), for loading conditions as specified in Paragraph 3.3.5 of this Part VII: **[E]**

(a) The following criteria in IMO 2000 HSC Code are complied with: **[E]**

(1) The positive residual righting lever curve shall have a minimum range of 15° beyond the angle of equilibrium. This range may be reduced to a minimum of 10° in accordance with Paragraph 2.1.1 of Annex 8 in the IMO 2000 HSC Code;

(2) The area under the righting lever curve shall be at least 0.015 metre radians in accordance with Paragraph 2.1.2 of Annex 8 in the IMO 2000 HSC Code;

(3) The maximum righting lever shall not be less than 0.1 m in accordance with Paragraph 2.1.3 and 2.1.4 of Annex 8 in the IMO 2000 HSC Code;

(4) The final waterline shall be below the level of any opening through which further flooding could take place by 300 mm; and

(5) There is a positive freeboard from the damage waterline to survival craft embarkation positions.

(b) The following criteria specified in Damaged Stability, Option 1 of The Workboat Code (from Maritime & Coastguard Agency) are complied with: **[E]**

(1) The angle of equilibrium does not exceed seven (7) degrees from the upright;

(2) The resulting righting lever curve has a range to the downflooding angle of at least fifteen (15) degrees beyond the angle of equilibrium;

(3) The maximum righting lever within that range is not less than one hundred (100) mm;

(4) The area under the curve is not less than 0.015 metre radians; and

(5) The damage should not cause the vessel to float at a waterline less than 75mm from the weatherdeck at any point.

3.4 Painting and Cathodic Protection

3.4.1 Paint shall be used on surfaces and any parts of the hull, deck, machinery and fittings as directed by GNC and shall not have adverse effects on the environment and/or health of persons onboard.

3.4.2 The volatile organic compound ("VOC") content limits of the paints shall comply with the Hong Kong Air Pollution Control (Volatile Organic Compounds) Regulations CAP 311W.

3.4.3 Paints shall be of a fire-retardant marine quality and be applied in accordance with the manufacturer's specification.

3.4.4 Exterior surfaces of the Vessel above the fully loaded draught mark shall be prepared and painted to a satin finish/appearance/texture.

3.4.5 Free fouling-release/anti-fouling paint in compliance with the International Convention on the Control of Harmful Anti-fouling Systems on Ships, 2001("AFS Convention") shall be applied on the exterior of the hull below the water line to provide at least two (2) years' protection against marine growth. The paint used shall be free from Tributyltin ("TBT") and Cybutryne. The fluoropolymer foul release coating / anti-fouling paint (e.g. Intersleek 1100SR or equivalent) shall comply with the AFS Convention. Details of the anti-fouling paint will be discussed at the kick-off meeting and shall be submitted to GNC and HKPF for approval.

3.4.6 The painting schedule shall be submitted for the approval of GNC before commencement of work. The proposal shall contain a list and the detailed specifications of the paint intended to be

used. The thickness of each coating shall be specified.

3.4.7 The Contractor shall guarantee all painting work for two (2) years against defects in materials and workmanship. At Delivery Acceptance, the Contractor shall provide GNC with a letter of certification from the paint manufacturer signed by qualified coating inspectors to certify that the paint has been applied under the paint manufacturer's quality control and in accordance with the manufacturer's requirements including but not limited to the surface preparation, surface temperature of the metal surfaces above dew point, atmospheric conditions, (temperature and relative humidity), dry film thickness and method of application.

3.4.8 All aluminium alloy walls, floor plates, and bilge areas beneath machinery shall be degreased and cleaned before painting. The surface treatment and costing application shall follow the manufacturer's recommendation. A painting schedule shall be proposed by the Contractor, in consultation with the paint suppliers/ manufacturers, and submitted to GNC for approval.

3.4.9 All deck areas shall be covered with hard wearing and anti-slip paint.

3.4.10 Surfaces that require painting shall be fully prepared and pre-drilled prior to painting.

3.4.11 All fastening preparation and other penetrations shall be completed before painting of any surface.

3.4.12 A painting report shall be submitted to GNC upon completion of work.

3.4.13 Underwater cathodic protection (self-sacrificing anodes) suitable for a minimum of one (1) year life shall be fitted to the hull bottom. Sacrificial anodes shall be in recessed pockets so they do not protrude beyond the hull bottom plating. No toxic substances shall be released from sacrificial anodes.

Chapter 4 General Arrangement

4.1 General Provision

4.1.1 Unless otherwise specified in this Part VII, the Conceptual General Arrangement Plan given in Annex 10 to this Part VII only serves as a reference. It is a reference drawing to illustrate how the Tender requirements could be fulfilled, and in no way a mandatory layout of the Vessel. The Contractor is encouraged to produce its own design which meets the Overall Specifications including all requirements of Technical Specifications in this Part VII. This Conceptual General Arrangement Plan shows a reference layout of the accommodation and compartment arrangement of the Vessel with the following maximum/minimum dimensional guidance considered:

Main deck side walkway width:	Minimum 700 mm
Clear headroom (Throughout Vessel):	Minimum 2000 mm

4.1.2 The Vessel shall be designed and constructed to be capable of carrying all crew and police officer of the following:

Number of Crew:	5	**[E]**
Number of Police Officer:	16	**[E]**

4.1.3 The Tenderer shall submit the Preliminary General Arrangement Plan in Schedule 7 of Part V for Government's consideration at the tendering stage. During the design and construction of the Vessel, the Contractor shall submit a detailed General Arrangement Plan for GNC's approval and acceptance.

4.1.4 It is a contractual requirement that ALL furniture, equipment and facilities, fixtures and fittings, including outfitting of the Vessel that are described in this Part VII, together with their requirements for design and installation standards that are stipulated in this Part VII shall be included in the completed "As- built" Vessel delivered to the Government.

4.1.5 The Tenderer should note that the requirements given in this Part VII (the TS) are in addition to the RO requirements and IMO requirements and shall be met by the design and construction of the Vessel.

4.1.6 Subject to full compliance with the requirements of stability and subdivision, each hull shall be subdivided by transverse watertight bulkheads into different compartments. Each compartment shall not be greater than 40% of the Vessel's length overall. As a reference, it can be divided as follows, subject to individual design:

(a) Fore peak;

(b) Crew space;

(c) Tank space;

(d) Engine room; and

(e) Waterjet room.

The superstructure shall comprise of one (1) tier of deckhouse.

4.1.7 The deckhouse shall comprise one each of the following:

(a) Wheelhouse (main switchboard and chart table);

(b) Fire protection system: fixed aerosol or fixed FM200;

(c) First aid kit & stretcher berth;

(d) Arms and ammunition storage locker; and

(e) Pyrotechnics storage locker;

4.1.8 The crew space below wheelhouse shall comprise one each of the following:

(a) Fridge

(b) Toilet facility;

(c) Settee for 5 crew;

(d) Food preparation area; and

(e) Tea table of size to be specified by the GNC and HKPF in the kick-off meeting.

4.1.9 External deck spaces shall include:

(a) Flat bow and aft main deck areas for efficient mooring operation;

(b) Sufficient space in front of the wheelhouse to move stretchered patients from the bow to the aft deck;

(c) Side walkways on the main deck for easy access to the fore deck and aft deck, including moving stretchered patients from the bow to the aft deck. The walking area on the deck shall be well illuminated for dark environments and night operations. Illumination lights shall not obstruct the movement of personnel;

(d) Railings and handrails shall be provided where necessary. Handrails shall be positioned internally and externally throughout the Vessel to GNC's satisfaction. Railings and handrails shall be made of aluminium alloy/marine grade stainless steel 316 or other appropriate non-corroding material. Braced stanchions on either side shall be provided at the area for open deck operations around mooring equipment for the Vessel. The openings in railings, if any, shall be closed with three (3) tiers of stainless steel chain in SS316 and fastened with quick release closures. Details to be discussed in the kick-off meeting;

(e) All railings and handrails shall be secured to provide support for persons on board, to prevent them from falling on to or being thrown on to the deck or overboard in adverse weather and sea conditions. The design shall consider the circumstances when persons on board are lined up together on one side of the deck in case of an emergency at sea; and

(f) Movable guardrails and stanchions shall be installed at the walkways of vessels during docking period to prevent people from falling from heights.

4.1.10 All interior decks shall be covered by non-slip vinyl sheet flooring with the colour to be approved by GNC and HKPF.

4.1.11 All controls, electrical equipment, high-temperature parts and pipelines, rotating assemblies or other items in cabins and compartments shall be properly placed, protected and/or insulated to maintain comfort and reduce the risk of injury.

4.1.12 Windows

(a) All windows shall be of RO approved type;

(b) All windows shall be weathertight. Window glass shall be fitted in frames and sealed with bedding compound in a weather-resistant rubber channel. All windows shall be constructed using toughened and laminated safety glass. Windows shall be mounted to prevent vibration and rattling, and to provide a cushioning effect to protect the glass;

(c) The details of all windows shall be submitted to GNC and HKPF for approval. Weathertightness tests shall be carried out after window installation as per RO requirements and to the satisfaction of GNC;

(d) RO type-approved retractable solar UV roller blinds shall be installed on all windows

throughout the Vessel. The blinds shall be capable of being retained in various positions, including partially lowered or fully lowered, without swinging due to Vessel's motions at sea;

(e) Two (2) wheelhouse windows on each side of the vessel shall be able to be opened from inside to a clear opening size which would let an adult swim through. They shall be located within reaching distance of the lookout and launch commander; and

(f) Sufficient safety glass breaker hammers shall be provided. They shall be located next to each set of windows in wheelhouse, for use in an emergency.

4.1.13 Lighting

(a) The lighting shall consist of fixtures installed throughout the Vessel for general illumination;

(b) The lighting distribution in any compartment which has multiple power sources shall be arranged such that the failure of one circuit does not leave any area without light;

(c) Unless otherwise specified, LED fixtures shall be used for interior lighting. If a compartment has both normal and emergency lighting requirements, every effort shall be made to combine functions and minimise the number of fixtures required;

(d) Overhead lighting fixtures shall be installed to provide uniform illumination throughout a compartment without contrasting light and dark areas. In arranging fixtures to provide a uniform level of illumination, they shall be spaced to provide maximum illumination on working surfaces. Lighting shall be arranged to avoid shadows being cast on working surfaces by stationary obstructions or by personnel as they perform their normal duties in that compartment. Emergency lighting shall consist of lighting fixtures dedicated to provide the Vessel with reduced general illumination during loss of ship service power. The primary source of power for emergency lighting shall be from the ship emergency battery system. Details can be found in Chapter 8 of this Part VII;

(e) Emergency egress routes shall be lit by emergency lighting (including specific capsize lighting) and include emergency escape path markings in both LED and luminescent versions to ensure visibility during low light or smoke conditions;

(f) A suitable degree of flexibility within the lighting system shall be provided to enable the operating personnel to adjust the lighting intensity and direction in different areas of compartments, and such arrangements shall also be available for individual instruments and controls;

(g) Exterior lighting fixtures shall be installed to illuminate the weather decks, ladders and walkways, obstructions such as windlass, passageways and changes in deck level;

(h) Floodlights shall be installed on the deckhouse structure to provide sufficient illumination for the safe operation of all deck equipment. Floodlight shall provide illumination up to five (5) m from the hull side to the surrounding water surface; and

(i) LED reading lights shall be supplied above all seats and chart table. The lights shall be able to be switched between white and red light or provided with a red covering to change the light to red.

4.1.14 Furniture and Fittings

(a) Built-in furniture shall be adequately secured against ship impacts in case of ship collision or in extreme weather and sea conditions. All seats shall be secured against 45 degrees of inclination in all directions when seats are occupied by seated persons. All furniture and seats shall be lightweight and robust. Upholstery such as seat cushions, back rests and sofas shall be of fire-resistant e.g. urethane foam to BS3379 or equivalent standard, and shall be of a thickness of not less than 100mm and be covered with leather or leather substitute

material;

(b) Lockers shall be provided with built-in locks and keys in cabins and other locations. They shall be designed and fitted to the satisfaction of GNC;

(c) All fittings and hardware installed onboard the Vessel (e.g. screws, hasps, hinges, handles, sliding bolts, coat hooks, ceiling lights, bulkhead mounted lights, etc.) shall be of a high-quality stainless steel or other metals with chrome finish provided that galvanic corrosion due to contact of dissimilar metals shall not be permitted. They shall be properly installed in all spaces as directed by GNC;

(d) Colour and decoration schemes (or a furnishing sample board showing materials and colour to be used) for furniture and fittings shall be submitted to GNC and HKPF for approval before installation/ fitting; and

(e) All furniture shall be fitted as to allow for easy removal of the underdeck machinery and tanks.

4.1.15 Insulation and Lining

(a) Insulation:

(1) Boundaries and ceilings around the inside of the deckhouse shall be insulated against heat and sound and shall be fitted with Rockwool of appropriate thickness (minimum 50 mm) or equivalent and be lined with protective/ decorative panel linings with a hard-wearing surface and sealed against water ingress;

(2) The engine room and machinery space(s) shall be effectively protected from fire and sound insulated with asbestos-free materials of adequate thickness, pinned and wire-mesh secured and lined with incombustible sheathing in accordance with IMO and RO Requirements and shall be acceptable to GNC; and

(3) The noise level in the crew space(s) shall not exceed 80dB(A) when the Vessel is operating at all speeds. The noise level in the wheelhouse shall be less than 75dB(A) to facilitate communication within the compartment and external radio-communications. The Contractor shall make all reasonable efforts to minimize noise and vibration in the Vessel.

(b) Lining:

(1) Panels for walls, ceilings and their joint materials shall be readily removable. The joining method shall provide long-lasting, firm and strong attachments between the adjoining members and parts against excessive vibration and shall withstand temperature changes and wear and tear within the life expectancy of the Vessel. The panels shall be fitted to avoid noise generation due to its own vibration or in resonance response to the overall vibratory mode of the Vessel. This requirement applies to all operational speeds of the Vessel. If the noise level is considered unacceptable to GNC, the Contractor shall improve the design and fitting methods of the panel/ceilings. The colour of the lining material shall also be agreed by GNC and HKPF; and

(2) The deck or floor of the wheelhouse shall be covered with non-skid, wear resistant and fire-retardant vinyl sheets that are acceptable to GNC. The colour of the floor covering shall be agreed by GNC.

4.1.16 Access, Doors, Ladders and Hatches

(a) All outfitting including, but not limited to, doors, hatches, ladders, ventilation heads, shall be type approved by the RO for this type of Vessel, or other entities acceptable to GNC. These shall require GNC acceptance and approval before installation;

(b) Ladder/stair rungs and steps shall be of an anti-slip type and be acceptable to GNC and HKPF;

(c) Detailed specifications of these items shall be provided by the Contractor to GNC. These shall include the structural arrangement, scantlings, material and welding procedures. These shall be in accordance with RO Requirements or other international standards acceptable to GNC;

(d) Flush RO type approved watertight manhole covers shall be used where necessary;

(e) Where the covers and doors are used for the purpose of escape, they shall be fitted with manual means of locking and shall be able to be quickly opened from both the inside and the outside of the compartment. All covers and doors shall be fitted with a retaining device. Hatches/ covers providing access to the watertight compartments below the main deck level shall be type approved by the RO. Watertight and weathertight hatches shall be of a hinged type as far as practicable;

(f) All deck hatches shall be fitted with a high-quality stainless steel or bronze commercial-grade marine-type locks. Locking of hatch cover(s) affecting escape shall be prohibited. Three (3) sets of keys shall be provided. All keys shall be tagged for identification;

(g) All door openings to external deck space shall be RO type approved and of an outwardly opening weathertight type. All doors shall be fitted with hooks or other means to secure them in the fully open position;

(h) Exterior side deck doors (if have) shall be hinged on the forward edge. If the door is accidentally left open, it will be naturally closed as the Vessel manoeuvres forward in accordance with RO requirements;

(i) All exterior doors shall be fitted with high quality stainless steel or bronze commercial-grade marine lever-type locksets. Three (3) sets of keys shall be provided. All keys shall be tagged for identification and all locks shall be keyed alike;

(j) Exterior handrails on main deck shall be constructed of aluminium and strongly secured to the perimeter of the main deck to provide support for persons onboard, to prevent them from falling or being thrown on to the deck or overboard in heavy weather and adverse sea conditions. The design shall consider the circumstances when all persons onboard are lined up together on one side of the deck in case of an emergency situation at sea;

(k) Vertical ladders shall be fixed to the superstructure, providing access between main deck and rooftop of the wheelhouse. Vertical ladders shall be equipped with climber safety rail fall prevention system. The width of ladders between stringers shall not be less than 400mm. The treads shall be equally spaced at a vertical distance of between 250mm and 300mm apart;

(l) All underdeck compartments (excluding fore peak) shall be provided with one means of access/escape and the size of opening shall be with a minimum dimension of 600mm x 400mm; and

(m) The wheelhouse shall be provided with two (2) widely separated means of escape and the size of opening shall be with a minimum width as specified by the RO.

4.1.17 Ventilation:

(a) The requirements for ventilators and the ventilation system shall comply with RO's requirements;

(b) The wheelhouse shall be protected from gas or vapour fumes from machinery, engine-exhaust gas and smells from the fuel system;

(c) The toilets shall be fitted with an exhaust fan with a capacity of not less than 36 air changes per hour; and a louvre at the lower portion of the toilet door shall be provided. There shall be covers for exhaust fans capable of being closed to prevent rainwater and seawater spray ingress;

(d) Air pipes shall be fitted to all tanks, void spaces, and all spaces and compartments which are not fitted with other types of ventilation arrangements. All air pipes shall be fitted with automatic closure devices to RO's requirements;

(e) The lower edge of openings in exterior air pipes and trunks shall be set at a minimum clearance above the main deck which shall comply with RO's requirements;

(f) All ventilators shall be provided with weathertight covers; and

(g) Equipment fixtures and fittings on board shall be fitted properly to avoid injury to persons at all times either during normal or failure-mode operation, especially when the Vessel moves off quickly or during emergency crash stops, and during ship manoeuvres.

4.1.18 A general emergency visual and audible alarm system shall be provided for the Vessel. The alarms shall be audible throughout the Vessel and the sound pressure level shall be at least 15dB(A) above the ambient noise levels anywhere in the Vessel and its spaces and compartments when the Vessel is in its normal operational conditions. The alarm shall continue to function after it is triggered until it is turned off or is temporarily interrupted by a voice message on the public address system.

4.1.19 A public address system shall be installed covering all areas and spaces of the Vessel, including escape routes, to which the crew have access. The system shall be installed in such a way that the system would not be rendered inoperable in the initial stages of flooding or fire in a compartment.

4.2 Wheelhouse

4.2.1 A wheelhouse shall be located at the front of the deckhouse on the main deck. The Contractor shall supply a 3D computer model of the Vessel interior for review by GNC and HKPF within two (2) months after the Contract Date. This shall be supplied in a format acceptable to GNC with no paid-license required. It shall be reviewed and approved in principle by GNC, following which the Contractor shall build and carry out a mock up inspection of the wheelhouse including the equipment arrangement, seats and other fittings as required under this Part VII. The mock up shall be inspected and agreed by GNC and the HKPF before the design is finalised.

4.2.2 The outside configuration of the wheelhouse shall be of a design that reduces air resistance, to deflect rain and seawater during heavy weather; and to provide practically all-round visibility at the steering/helm position. Pillars shall not be fitted inside the wheelhouse to avoid obstructing visibility and CCTV coverage.

4.2.3 Wheelhouse Marine Shock Mitigating Seats:

(a) Five (5) heavy duty pedestal seats with hydraulic damping system, armrest with safety belts shall be provided for the following personnel (one seat for each member of the personnel):

(1) Launch commander;

(2) Coxswain;

(3) Engineer;

(4) Communications officer; and

(5) Lookout.

(b) The requirements of the marine shock mitigating seats are listed as the followings:

(1) Seats shall be designed and installed in accordance with the 2000 HSC Code;

(2) Material of the structure: stainless steel and/or aluminium alloy;

(3) Materials of upholstery: heavy duty vinyl or leather;

(4) Height, direction and fore and aft positions of these seats shall be adjustable and suitable for those of Asian statue of 1.64m tall;

(5) The seats shall have high density foam cushions, adjustable back rest, folding arms, lumbar support and adjustable footrest;

(6) Suspension seats with multi-level adjustable dampers which provide progressive damping, and allow vertical and longitudinal adjustments; and

(7) Shall be a proprietary made product.

4.2.4 Dedicated seating shall be provided in the wheelhouse for the launch commander, coxswain, engineer, communications officer and lookout. The launch commander's seat, coxswain's seat and lookout's seat shall be arranged at the front, with the coxswain's seat be positioned on the Vessel's centreline, the launch commander's seat be situated immediately to the starboard side of the Vessel's centreline and the lookout's seat be situated immediately to the port side of the Vessel's centreline. The seats for the communications officer and engineer shall be situated behind the launch commander, coxswain, and lookout, in such a way that could facilitate the operation and communication with officers at front. The wheelhouse layout plan shall be submitted for HKPF and GNC approval.

4.2.5 Essential controls for the use in adverse sea conditions shall be integrated to the seat and armrests, which shall be direct accessible by coxswain, to mitigate the increased occupational safe and health risks of crews for leaning forward to manipulate controls in a dynamic environment. Details will be addressed in kick-off meeting.

4.2.6 The equipment and means for navigation, manoeuvring control, communication and other essential instruments shall be located sufficiently close together to enable the coxswain and launch commander to read/receive all the necessary information and be able to use the equipment and controls whilst seated.

4.2.7 Instruments, instrument panels and controls shall be permanently mounted in the consoles, taking into account operational, maintenance and environmental needs.

4.2.8 All instruments shall be logically grouped according to their functions. In order to reduce the risk of confusion, instruments shall not be rationalized by share functions or by inter-switching. The proposed console arrangement shall be reviewed and approved by GNC and HKPF prior to installation.

4.2.9 Instruments required for use by any member of the operating crew shall be plainly visible and easily read with minimum practicable disposition from his/her normal seating position and deviation from line of vision. (i.e. they will cause minimum risk of confusion under all likely operating conditions.)

4.2.10 Gauges, indicators, and displays shall be provided with adjustable intensity backlighting. Lighted gauges, alarm indicators, and displays shall be arranged so that they do not reflect on the wheelhouse windows during night operations. Glare shall be avoided.

4.2.11 The surfaces of console tops and instruments shall be a dark glare-free colour. Surface finishing and interior linings in the wheelhouse shall be of a matt non-reflecting finish to facilitate day and night time operation.

4.2.12 The following controls, displays and equipment are required to be incorporated into the wheelhouse so that all relevant controls can be reached from any normal working position (e.g. sitting, standing or both):

(a) Steering shall be controlled by appropriate control devices, e.g. joystick(s), thrust controller(s), etc. A secondary steering control system which is the same or similar to the coxswain's system shall be provided for the Officer of the Watch ("OOW"). Detailed arrangement shall be discussed in the kick-off meeting;

(b) Engine speed and clutch controls;

(c) Steering angle indicators;

(d) Rate of turn indicators;

(e) Watertight doors and hatches open/close monitoring and alarm system;

(f) Operational systems and displays;

(g) Speed log;

(h) Echo sounder;

(i) Lighting control panel incorporating controls for navigation lights, alarms, searchlights, and flood lights;

(j) Main and auxiliary engine monitoring indicators and tachometers;

(k) Instruments, controls and alarm systems for major machinery together with start/stop switches;

(l) LED colour monitors linked to the Vessel's CCTV system;

(m) External broadcasting system, public address and intercom system;

(n) Electric horn, siren, and blue flashing beacon control panel;

(o) Magnetic compass;

(p) Wind speed and direction display;

(q) Search light control panel;

(r) EFFS control panel; and

(s) Electronic navigation equipment and displays.

4.2.13 The instrument panels for the emergency controls and monitoring of the fire-fighting systems shall be at the wheelhouse engine remote control console. The locations shall be clearly defined and agreed to by GNC and HKPF.

4.2.14 The engineering systems being monitored and controlled at the wheelhouse engine remote control console through a Monitoring and Control System ("MCS") as more particularly specified in Paragraph 8.15 of this Part shall be displayed on the Multi-Function Displays ("MFD") together with links to the Vessel's CCTV system. Details shall be discussed at the kick-off meeting. This equipment and their information to be displayed through the MCS shall include but not be limited to:

(a) All the main diesel engine alarms and running parameters;

(b) All the diesel generator alarms and running parameters;

(c) AC electrical system;

(d) All the water-jet alarms and running parameters;

(e) All the gearbox alarms and running parameters;

(f) Fire detecting system and alarm;

(g) Fire extinguishing system and alarm;

(h) Fans (under main deck) control;

(i) General engineering system including fire pump control, bilge alarm and pump control, and tank level alarm and gauges (freshwater tank, fuel oil tank, lubricating oil, etc.);

(j) Sewage system;

(k) Marine growth protection system;

(l) Air conditioning system;

(m) Watertight door and hatch open/close monitoring and alarm system;

(n) Other related alarm signal and any other signal (if applicable); and

(o) Any other alarm controls, gauges or monitors as required by GNC.

Detailed arrangements of the aforesaid monitor display shall be agreed by GNC and HKPF.

The above MCS shall be an additional and shall not replace any remote control system and operating panel provided by engine or system provider e.g. main engine, waterjet, etc.

In addition, the multi-function displays of the MCS including the one at the wheelhouse engine remote control console shall also be capable of connecting to and controlling the CCTV system onboard.

4.2.15 The following displays and equipment shall be incorporated into the launch commander's console so that all the relevant controls can be reached from any normal working position (e.g. sitting, standing or both):

(a) As specified in Paragraph 9.3.3(e) of this Part VII, one (1) 19" high definition multi-function display, which is the dedicated display and control panel for the X-band solid state marine radar, shall be capable of displaying at least the following systems' images via the Integrated Navigation System:

(1) X-band IMO compliant navigation radar;

(2) ECDIS;

(3) EOSS; and

(4) Conning information.

(b) Details of the system functionality shall be discussed with and approved by the HKPF and GNC.

4.2.16 The following display and equipment are required to be incorporated into the communications officer console so that all relevant controls can be reached from any normal working position (e.g. sitting, standing or both):

(a) As specified in Paragraph 9.3.3(f) of this Part VII, two (2) 19" high definition multi-function display which can display at least the following system and other systems via the Integrated Navigation System:

(1) ECDIS;

(2) EOSS;

(3) Conning information;

(4) CCTV; and

(5) Marine Situational Awareness System ("MARSAS") provided by the HKPF as described in Paragraph 9.21.2 of this Part VII.

(b) In addition to the multifunction display, the following equipment display units shall be fitted at the communications officer's console:

(1) Secure Automatic Identification System ("S-AIS");

(2) GNSS;

(3) Very High Frequency ("VHF"); and

(4) Police Marine Radio Communications Systems ("MRCS") radio system (to be

supplied by the HKPF).

(c) Additionally, within close proximity to the communications officer's console, there shall be a working chart table designed and installed as follows:

(1) The chart table shall be able to handle paper charts, paper documentation and for general use as a desk; and

(2) Details of the system functionality are to be discussed and approved by the HKPF and GNC.

4.2.17 Visibility

(a) The visibility from the wheelhouse shall not be obstructed;

(b) Large rear view side mirrors, and CCTV cameras shall be installed at locations to allow the coxswain to safely manoeuvre the Vessel to a berth and have a clear view during such operation;

(c) CCTV cameras shall be fitted at the port and starboard sides amidships, to facilitate viewing to the side of the Vessel;

(d) Visual blind spots or sectors shall be minimised (i.e. as few and of as small an angle as possible), and in any case, they must not adversely affect the keeping of a safe lookout from the helm position in the wheelhouse; and

(e) All equipment fitted in the vicinity of the wheelhouse should not obstruct the view of the launch commander, engineer, coxswain, lookout and communications officer.

4.2.18 Wheelhouse Windows

(a) Wheelhouse window frames/ mullions shall be kept to a minimum, whilst maintaining the required structural strength and stiffness in accordance with RO's requirements. They shall not be installed directly in front of any workstation;

(b) Forward facing windows shall be inclined forwards and provide visibility which is free of any glare under all normal operating conditions. The wheelhouse front windows shall be inclined from a vertical plane topside outwards to reduce unwanted reflection, at an angle of not less than 10° and not more than 25°;

(c) Wheelhouse windows shall be arranged to provide for the maximum practicable visibility for navigation and boat operations. All wheelhouse windows shall be fitted with retractable tinted solar blinds with RO type-approval to reduce glare. Forward wheelhouse windows shall be fixed. A minimum of one (1) sliding window on each side of the wheelhouse shall provide visual access to the sides of the Vessel for manoeuvring and allow a crew to be able to pass through the sliding window in emergence situation. Details of the sliding windows shall be discussed at the kick-off meeting;

(d) Electrically operated window wipers shall be installed on all wheelhouse front and forward side windows. They shall be of heavy-duty marine type and selected to sweep a minimum of 75% of the clear area of the window to which they are mounted. The wipers shall effectively clear the glass and maintain good vision in heavy rain conditions. The operating mechanism and control equipment shall be located inside the wheelhouse. The control equipment for each wiper shall be located on or near the wiper it controls, within easy reach of the operator. The wipers shall be operated independently. Two (2) sets of spare wiper blades shall be provided for each window wiper installed on the Vessel;

(e) An electrically operated freshwater window washer system for all windows with wipers shall be provided. The window washer system shall provide a spray in sufficient quantity and with a spray pattern that shall remove a film of salt spray from the area covered by the wiper. The washer system controls shall be located in a location adjacent to the window wiper controls; and

(f) Details of all the windows including the window glass thickness shall be submitted to RO and GNC for approval prior to installation.

4.2.19 The following fittings and equipment shall be provided, as a minimum, in the wheelhouse to the satisfaction of GNC and the HKPF:

(a) One (1) display board for posting plans, charts, notices, etc.;

(b) Two (2) wall mounted fans of diameter 200mm;

(c) One (1) set of pigeonholes for the stowage of international code flags;

(d) One (1) set of international code flags suitable for the mast;

(e) One (1) shelf for the stowage of logbooks and files with retention bar;

(f) One (1) dial type inclinometer and one (1) barometer with thermometer for marine use;

(g) One (1) magnetic compass with independent illuminated dimmer switch;

(h) One (1) electrically powered marine wall-mounted clock;

(i) Five (5) cup holders;

(j) One (1) waste basket (to be concealed and secured);

(k) One (1) lockable key cabinet shall be sized to provide a separate hook for the keys to each lock. Each key hook shall be labelled to identify the purpose of the key;

(l) Two (2) lockable storage boxes, with closed cell foam lining, for the storage of binoculars, to be fitted in the vicinity of the communications officer and launch commander. Two (2) waterproof and fog proof 7 x 50 marine binoculars for daytime use shall be provided;

(m) Five (5) coat hooks;

(n) As many storage cupboards/lockers as possible within the space without compromising working areas or wheelhouse visibility;

(o) One (1) framed fire and safety plan of an appropriate size;

(p) Sufficient non-slip handholds at suitable locations to facilitate safe crew movement in rough sea conditions;

(q) One (1) approved type first aid box;

(r) Five (5) wall mounted (220V AC) electrical sockets (Type G for Hong Kong);

(s) Footrests shall be provided for the five (5) shock mitigating seats in the wheelhouse. They are to be recessed into the wheelhouse dash;

(t) A spirit level shall be installed forward and the above the eye line of the coxswains seated position; and

(u) Two (2) convex mirrors shall be installed to provide the launch commander when seated with a view of the aft starboard segment and directly aft through the aft windows of the wheelhouse. One (1) shall be affixed to the forward starboard window mullion and one (1) shall be affixed to the deck head forward and above the eye line of the launch commander.

4.3 Arms and Ammunition Locker

4.3.1 A dedicated locker shall be designed and located in the wheelhouse for the storage of arms and ammunition.

4.3.2 The arms and ammunition locker shall be located in a position where surrounding compartments and passageways provide a protective buffer against external attack or impact.

4.3.3 The arms and ammunition locker shall be protected from adjacent spaces by structures meeting the IMO SOLAS A60 standard including the doors and shall be located as far away as possible from the accommodation spaces.

4.3.4 Compartments/facilities adjacent to the arms and ammunition locker shall not contain high fire risk stores, equipment (including electrical items), processes or activities. Such compartments/facilities include:

(a) Refuelling points;

(b) Main and auxiliary machinery spaces;

(c) Compartments used for storing or mixing paint and solvents or other stores having a flashpoint of less than 60.5℃;

(d) Compartments used for storing acids;

(e) Fuel and oil tanks;

(f) Compartments containing chemicals;

(g) Engine exhaust uptakes;

(h) Food preparation area; and

(i) Battery compartments.

4.3.5 If a machinery space or engine exhaust uptake is adjacent to the arms and ammunition locker boundary, ventilated air spaces shall be provided between the space or uptake and the arms and ammunition locker boundary.

4.3.6 High fire risk equipment and electrical fittings shall not be fitted to the external surfaces of the arms and ammunition locker boundaries. Where this is unavoidable, equipment and cabling shall be at least 50 mm clear of the boundary to assist boundary cooling and facilitate ship structural maintenance.

4.3.7 Electrical cables passing through adjacent compartments, but not associated with equipment therein, shall be continuous i.e., with no junction boxes fitted and meet the IMO SOLAS A60 requirements.

4.3.8 Compartments adjacent to the Arms and Ammunition Locker (except heads, bathrooms, tanks, lobbies and airlocks), as well as the locker itself, shall be fitted with fire detectors linked to audible and visual alarms in the Vessel's fire protection system.

4.3.9 The storage facilitates for arms and ammunition shall be designed to allow handguns, ammunition and other weapons to be stored in the same room. Finalised details of the types and quantity of arms and ammunition are to be discussed at the kick-off meeting but at a minimum stowage shall be provided for the following weapons and ammunition:

(a) Two (2) long barrel weapons;

(b) Five (5) handguns;

(c) Five (5) pairs of handcuffs;

(d) Five (5) extendable batons;

(e) One (1) signal pistol;

(f) Five (5) Oleoresin Capsicum ("OC") Foam irritant aerosols; and

(g) Space for approx. 300 rounds of ammunition of various calibres.

4.3.10 Suitable racking, drawers, cupboards, cabinets and a safe are to be designed to securely and safely contain the arms and ammunition, with the ammunition stored in HKPF approved packaging (e.g. H83 metal boxes). Supports for stowages shall not be affixed to hull plating.

4.3.11 Stowages shall be designed to allow water from the fire suppression system to cool all weapons and ammunition in the stowage. Any shelving shall have one or more drainage holes to allow water from fire suppression systems to cool arms and ammunition in the stowage.

4.3.12 A minimum of 75 mm shall be provided between the rear, sides and undersides of stowages and the arms and ammunition storeroom boundaries to permit effective boundary cooling.

4.3.13 Stowage shall be designed to allow water from the firefighting system to cool the arms and ammunition locker. Any stowage capable of retaining water shall be provided with a practical means of drainage.

4.3.14 The arms and ammunition locker shall be lockable with a built-in lock. Three (3) sets of keys shall be provided. All keys shall be tagged for identification.

4.4 Pyrotechnics Store

4.4.1 A separate pyrotechnics store shall be provided.

4.4.2 The pyrotechnics store is to be designed for stowage of the following pyrotechnics, which shall be contained in standard H83 or H82 metal storage boxes:

(a) Twelve (12) red illuminating parachute flares;

(b) Sixteen (16) white illuminating parachute flares;

(c) Twenty (20) x 1" white signal cartridges;

(d) Twenty (20) x 1" red signal cartridges;

(e) Twenty (20) x 38mm white illuminating cartridges;

(f) Eight (8) red distress signal flares; and

(g) Four (4) orange smoke buoyant markers.

4.4.3 The storage shall be carefully designed and installed to prevent the pyrotechnics moving whilst the Vessel is underway as well as to facilitate ease of removal in emergencies.

4.4.4 Either a metal cage, suitable racking, drawers, cupboards or cabinets are to be designed to safely contain the pyrotechnics. Supports for stowage shall not be affixed to hull plating.

4.4.5 The pyrotechnics store shall be protected from adjacent spaces by structures meeting the IMO SOLAS A60 standard including the doors and shall be located as far away as possible from the accommodation spaces.

4.4.6 Stowage shall be designed to allow water from the firefighting system to cool the pyrotechnics locker. Any stowage capable of retaining water shall be provided with a practical means of drainage.

4.4.7 A minimum of 75 mm shall be provided between the rear, sides and undersides of stowage and the pyrotechnics store boundaries to permit effective boundary cooling.

4.4.8 Compartments adjacent to the pyrotechnics store shall not contain high fire risk stores, equipment (including electrical items), processes nor activities. Such compartments include:

(a) Refuelling points;

(b) Main and auxiliary machinery spaces;

(c) Compartments used for storing or mixing paint and solvents or other stores having a flashpoint of less than 60.5°C;

(d) Compartments used for storing acids;

(e) Fuel and oil tanks;

(f) Compartments containing chemicals;

(g) Engine exhaust uptakes;

(h) Food preparation area; and

(i) Battery compartments.

4.4.9 If a machinery space or engine exhaust uptake is adjacent to the pyrotechnics storeroom boundary, ventilated air spaces shall be provided between the space or uptake and the pyrotechnics storeroom boundary.

4.4.10 High fire risk equipment and electrical fittings shall not be fitted to the external surfaces of the pyrotechnics storeroom boundaries. Where this is unavoidable, equipment and cabling shall be at least 50 mm clear of the boundary to assist boundary cooling and facilitate ships structural maintenance.

4.4.11 Electrical cables passing through adjacent compartments, but not associated with equipment therein, shall be continuous i.e., with no junction boxes fitted and shall meet the IMO SOLAS A60 requirements.

4.4.12 Compartments adjacent to the pyrotechnics store (except heads, bathrooms, tanks, lobbies and airlocks), as well as the pyrotechnics storeroom, shall be fitted with fire detectors linked to audible and visual alarms in the Vessel's fire protection system.

4.4.13 The environment within the pyrotechnics store shall be controlled to ensure stored pyrotechnics serviceability is not affected by temperature or humidity fluctuations.

4.4.14 The storage arrangements are to be approved by GNC and HKPF prior to installation.

4.4.15 The pyrotechnics store shall be lockable with a built-in lock. Three (3) sets of keys shall be provided. All keys shall be tagged for identification.

4.5 Forepeak

4.5.1 The fore peak shall be arranged at the foremost part of the hulls. The position of the collision bulkhead and its construction shall comply with the applicable RO's requirements. Suitable ventilation shall be arranged for the compartments and shall meet the requirements of the RO.

4.5.2 A flush watertight hatch cover shall be provided on the main deck for accessing fore peak.

4.6 Crew Space

4.6.1 Sofa that could accommodate at least five (5) persons, one (1) tea table and some lockers shall be arranged in the crew space.

4.6.2 A watertight door shall be provided at the aft bulkhead of the compartment with access to the aft compartment.

4.6.3 The food preparation area of open plan layout and equipped with solid food storage shall be designed. It shall allow safe operation for the crew to prepare meals when underway. As a minimum, the food preparation area shall include the following:

(a) One (1) refrigerator to be arranged, not to contain ozone depleting substances, the size and type of the refrigerator to be determined by the HKPF;

(b) One (1) microwave oven;

(c) One (1) stainless steel sink having a tap with warm and cold water supply and with a water filter, the type to be determined by the HKPF;

(d) Bench and cabinet/cupboards for the microwave oven and sink to be located; and

(e) Five (5) 220V AC electrical sockets (Type G, Hong Kong).

4.6.4 One (1) washroom shall be provided in crew space below the wheelhouse. The washroom shall be well ventilated. One (1) electric exhaust fan capable of not less than thirty-six (36) air changes per hour shall be provided, and the exhaust air shall be routed outside the Vessel. The bathroom shall be provided with cold water supply and, as a minimum, shall include the following:

(a) The washroom door shall be of aluminium opening outwards and capable of being opened from the outside. The lower portion of the door shall have a louver. All fixtures, partitions and laminations shall be approved by GNC and HKPF. All wet spaces shall be provided with a surrounding coaming fully welded to the Vessel's deck. It is to be painted in a suitable coating;

(b) The washroom shall be fitted with non-slip flooring and waterproof grating; and

(c) The sewage system shall be designed in such a way that no foul odours are generated by the breakdown of organisms in the sea water flushing and other system components;

(d) As a minimum, the washroom shall incorporate the following:

(1) One (1) seated toilet with vacuum system;

(2) A stainless steel wash basin (with cold fresh water tap) including a towel bar, grab bar, and soap dish;

(3) One (1) water delivery point under the wash basin with a plastic hose for cleaning the washroom;

(4) One (1) mirror with vanity lights;

(5) One (1) toilet paper holder;

(6) One (1) waste bin; and

(7) Drain(s) are to be provided to prevent water accumulation on the toilet floor. Floor covering shall pitch to a floor drain. The grey water shall be discharged overboard through a non-return shipside valve. The arrangement shall meet the RO's requirements and acceptable to GNC.

4.7 Tank Room

4.7.1 A Tank Space shall be located under the main deck and aft of the crew space. This compartment with the equipment and tanks shall be arranged to maintain the Intact Stability Criteria specified in Paragraph 3.3.9 of this Part VII and the Damaged Stability Criteria specified in Paragraph 3.3.10 of this Part VII and shall be accepted by GNC and the HKPF. Suitable ventilation shall be provided for the compartments which shall meet the requirements of the RO.

4.7.2 Two (2) flush watertight hatch covers shall be provided on the main deck.

4.7.3 The compartment shall be equipped with the following:

(a) Fuel oil; and

(b) Any other equipment as required by GNC and HKPF.

The arrangement of the equipment and tanks above shall be so arranged as to provide simple efficient operation and maintenance.

4.7.4 The Contractor shall design and install the compartment in accordance with the 2000 HSC Code with respect to the required structural fire protection, fire detection and fire suppression and shall meet the requirements of the RO. Noise and vibration transfer to the superstructure spaces shall

be avoided.

4.7.5 Forced ventilation shall be provided for the tank room.

4.8 Engine Room

4.8.1 The layout of engine room shall be in accordance with the IMO and the RO's requirements and shall be approved by GNC and the HKPF. For the avoidance of doubt, the Vessel shall comply with the specific requirements in this section.

4.8.2 Special attention shall be paid to the layout of the engine room ensuring easy and convenient installation, operation and access for maintenance/repair.

4.8.3 The engine room shall be designed for unattended engine room operation and protected by a fixed fire-fighting system.

4.8.4 The machinery associated with the piping system and fittings shall be installed and protected so as to minimise the risk to personnel onboard.

4.8.5 All hot surfaces susceptible to contact with flammable liquids shall be insulated. The insulation shall be impervious to flammable liquids and vapours.

4.8.6 Splash plates, casings, fenders, screens, etc. shall be provided for the protection of personnel and machinery.

4.8.7 Floor plates, handrails and guards shall be referenced to Paragraph 7.18 of this Part VII.

4.8.8 Forced ventilation shall be provided for the engine rooms in accordance with RO requirements.

4.9 Waterjet Room

4.9.1 The layout of the waterjet room shall be arranged for easy and convenient installation, operation and access for maintenance/ repair.

4.9.2 The space shall be readily accessible to and from the main deck via a watertight hatch.

4.9.3 Provisions are to be made for emergency steering in accordance with RO requirements to the satisfaction of GNC.

4.9.4 Forced ventilation shall be provided for the waterjet room.

4.10 External Deck Area

4.10.1 All external deck floor shall be covered with anti-slip paint/material to the satisfaction of GNC and HKPF.

4.10.2 Bollards, fairleads and cleats shall be arranged for mooring the Vessel, as required and arrangements shall be submitted to GNC and HKPF for acceptance.

4.10.3 In addition to requirements specified in other sections, the forward main deck area shall be designed and installed as follows:

(a) The deck area shall be protected by a foredeck;

(b) The deck area shall be clean and simple for efficient anchoring and mooring;

(c) The deck area geometry of the Vessel shall be carefully designed to facilitate safe mooring to the satisfaction of GNC and HKPF. Fenders specified in Paragraph 4.13 of this Part VII shall be fitted adequately to protect the Vessel;

(d) There shall be a weathertight aluminium alloy locker on the fore main deck area for the stowage of portable fenders, mooring lines. A bosun store shall be provided for the stowage of miscellaneous items, e.g. mooring lines, towing ropes, typhoon mooring equipment, fenders spare cordage, etc. not in daily use.;

(1) The locker shall be fabricated with a hinged doors capable of being secured open with a locking device fitted to prevent the doors from inadvertently closing, whilst the locker is in use; and

(2) The locker shall be opened, without shelving, and shall be as large as practical within the deck space available to the discretion of GNC.

(e) In addition to requirements specified in other sections, the foredeck shall have the following equipment/ fittings:

(1) One (1) windlass as detailed in Paragraph 4.12.2 of this Part VII; and

(2) Typhoon mooring equipment as detailed in Paragraph 4.12.8 of this Part VII.

4.10.4 In addition to requirements specified in other sections, the side main deck area shall be designed and installed as follows:

(a) The width of the side deck on both sides of the main deck shall be at least 0.70 metre for the safe passages of crew with the stretcher. Access shall be provided on each port and starboard side on the main deck; and

(b) Components including but not limited to air vents and pipes should be recessed into the deckhouse sides.

4.10.5 An array of lashing points shall be placed on the aft deck to secure cargo and stretcher. Further details to be provided at the kick-off meeting.

4.10.6 An aluminium removable/folding dive ladder shall be provided. It shall affix to a suitable position that could allow divers access to and from the water. The arrangement and stowage plan shall be submitted to GNC and HKPF for acceptance.

4.10.7 A removable/foldable rescue ladder shall be provided. It shall be able to be temporarily affixed at a suitable position to allow rescued persons access to the main deck from the water. The fixing mechanism shall be flush with main deck so it does not become a tripping hazard. The arrangement and stowage plan are to be submitted to GNC and HKPF for acceptance.

4.10.8 A vertical ladder shall be provided for access to the wheelhouse roof.

4.10.9 Removable hatch cover for main engines and generators shall be provided. Any equipment must be able to be moved out from the engine room. The arrangements shall be submitted to GNC and HKPF for acceptance.

4.11 Mast and Ensign Staff

4.11.1 The mast shall be fitted on the wheelhouse roof with navigational lights, patrolling duty light (blue flashing), radar scanner and other electronic and navigation equipment, including the lightning arrestor/dissipater, ensign hoist, two (2) signal hoists, antennas, GNSS, VHF, UHF and mobile transceivers. Antennas, GNSS, VHF, UHF, mobile transceivers and radar scanner shall be alternatively installed on the wheelhouse roof. Details shall be discussed in the kick-off meeting.

4.11.2 The structure of the mast associated with its mountings and fixtures shall be designed so that all the equipment as stated in this Part VII can be operated in all weather conditions, with general provisions as follows:

(a) The mast is designed to accommodate all the navigation lights, patrolling duty light (blue

flashing) and signal lights indicating types of operation and meet the requirements of the International Regulations for Preventing Collisions at Sea, 1972 ("COLREGs"). Arrangement shall also be provided for the hoisting of navigational signal shapes, national and regional flags, as well as, flags provided by HKPF;

(b) The mast shall be constructed in such a way that no vibration is experienced in any operating conditions. The mast design shall be of appropriate size/strength to suit its intended purpose; and

(c) All equipment and their related cables, conduits, connectors, junction boxes, glands and fittings shall be waterproof and be able to function in all weather conditions at sea.

4.11.3 Two (2) ensign staff for flags shall be supplied with the length and size to be confirmed with GNC and HKPF. One (1) ensign staff shall be placed at the mast and the other one (1) to be placed at the top of the aft main deck. All hardware for the ensign staff, such as screws, hooks, hasps, hinges, handles, sliding bolts, etc. shall be made of stainless steel.

4.12 Anchoring and Mooring Equipment

4.12.1 In addition to the requirements specified in other sections, the anchoring equipment shall meet the requirement as follows:

(a) The anchoring equipment arrangement and performance shall be in accordance with the RO's requirements. The anchor stowage shall be arranged for efficient handling and securing of the anchor, with consideration given for other functions such as mooring and towing operations. The arrangement shall be capable of retrieving and storing the anchor(s) in all operating conditions;

(b) At least one (1) super/very high holding power type anchor approved by the RO for the Vessel and acceptable to GNC shall be provided with its associated swivel, shackles, stowage cable or cable and warp, as well as, means of recovery;

(c) The Vessel shall be provided with an adequate and safe means for releasing the anchor and its cable and warp;

(d) The means of release shall be suitable for safe operation even when the anchor cable or warp is under load;

(e) Adequate means and arrangements shall be provided to secure the anchor under all operational conditions;

(f) Adequate stainless steel chain shall be provided with shackle(s). Materials other than stainless steel shall be approved by GNC and HKPF. All equipment to be sized in accordance with RO's requirements;

(g) The anchor shall be handled by use of a windlass with interlock between remote (electric) control and manual operation and associated fittings. Water ingress from the main deck shall be kept to a minimum, a spurling pipe shall be fitted on the deck leading down to the chain locker;

(h) A spare anchor shall be fitted/provided in accordance with RO's requirements; and

(i) Quick release arrangements shall be provided to release the anchor in emergencies.

4.12.2 In addition to the requirements specified in other sections, the windlass for anchoring shall meet the requirement as follows:

(a) A windlass with interlock between remote (electric) control and manual operation with its associated gypsy and warping drum, cable stopper, hawse pipe, bollards, bow roller(s) and fairleads shall be provided to give an easy run for anchor chain cables and mooring lines.

The windlass shall be fitted with an emergency manual operating mechanism;

(b) The windlass shall be capable of lifting one (1) anchor with sufficient length of chain, at a speed (The speed of raising anchor should be faster than 13m/min) acceptable to the RO and shall meet the IMO requirements. The unit shall be fitted with an emergency manual operating mechanism;

(c) Control of the windlass shall be located in the vicinity of the windlass through a starter control unit enclosed in a watertight cabinet;

(d) Emergency stop button for the windlass shall be provided locally; and

(e) A canvas/tarpaulin protection cover for the windlass shall be provided.

4.12.3 The Vessel shall be protected from the possibility of being damaged by the anchor and cable during operation (including in adverse weather and rough sea conditions).

4.12.4 The size of the chain locker shall be suitable for the self-stowage of the chain by gravity in all sea conditions.

4.12.5 Where necessary, suitable fairleads, bitts, bollards and mooring ropes shall be provided and fitted according to RO Requirements. All mooring ropes shall incorporate snap back arrestor technology.

4.12.6 Two (2) stainless steel boat hooks with three (3) metres staves and stowage arrangement shall be supplied.

4.12.7 Two (2) bollards shall be mounted on the aft main deck for towing a vessel of similar size and displacement at a speed up to five (5) knots and with all ropes incorporating snap back arrestor technology. The bollards shall be sized in accordance with RO's requirements.

In addition, for the towing operation, another optional solution is available: a quick-release tow hook that can be controlled both locally and remotely is installed at the aft main deck.

4.12.8 Typhoon mooring

(a) In order to safely moor the Vessel offshore during a typhoon, the Vessel shall be tied up to an existing offshore swinging mooring buoy, as shown in Annex 11 to this Part VII. The typhoon mooring system shall be designed for the Vessel to be moored under extreme weather conditions at typhoon signal number 10 in Hong Kong. Details of the typhoon warning signal system with the corresponding wind speeds are also shown in Annex 11 to this Part VII;

(b) The Vessel shall be able to adopt either single mooring or mooring trot during typhoon mooring. For single mooring, the Vessel is to be secured on to the bow mooring buoy using two (2) typhoon mooring lines (one (1) on the port side and one (1) on the starboard side). For mooring trot, the Vessel shall be secured onto the stern mooring buoy using another two (2) typhoon mooring lines (one (1) on the port side and one (1) on the starboard side), in addition to the aforementioned two (2) typhoon mooring lines at the bow mooring buoy;

(c) The typhoon mooring lines shall be fibre ropes with high strength, light weight, high resistance to abrasion, UV light and chemicals, and shall incorporate snap back arrester technology;

(d) The typhoon mooring lines shall be made fast onto port and starboard side mooring double bollards in a figure of eight. At the buoy end, the termination of the fibre mooring rope shall be fitted with a suitable shackle, or other suitable quick connecting and releasing devices, in order to connect to the mooring buoy. The spliced eyes shall be fitted on galvanised steel thimbles as the interface between the rope eye and the pin of the connecting element;

(e) The bollards shall also be designed and installed so they can be used for an emergency tow by other vessel(s) as required by the RO; and

(f) Only RO type-approved components shall be used in the typhoon mooring system. Design, manufacture and NDT shall be to the satisfaction of the RO and GNC.

4.13 Fenders

4.13.1 Side and stem fenders

(a) Robust foam filled rubber fenders of a suitable size acceptable to GNC shall be fitted continuously along the ship sides and bow at the main deck level;

(b) The hull structures shall be suitably strengthened for the proposed fendering arrangement; and

(c) Considerations to protect the side fenders against shearing shall be given, for the situation when a vessel of similar size is directly moored at side of the Vessel, due to the rolling of the vessels and ship-to-ship contacts.

4.13.2 The Contractor shall supply portable air-filled fenders of adequate size and strength to support the Vessel during mooring operations alongside. The number required and size shall be agreed with GNC and the HKPF.

4.14 Fixed Crane

4.14.1 One (1) set of electrical crane shall be provided, fixed on the aft deck, which must have sufficient lifting capability (500 kg capability) within the allowable Safe Working Load ("SWL") at the corresponding outreach about 2 meters, with a good clearance from the side of the Vessel for meeting daily lifting work need such as consumables aboard.

4.14.2 The crane shall be bolted or welded to the main deck foundation structure in accordance with RO Requirements, and to the satisfaction of GNC and the HKPF.

4.14.3 The crane shall be a marine type of class certified by any one RO listed in Annex 9 of this Part VII and acceptable to GNC. It shall be installed and tested in accordance with the RO Requirements to the satisfaction of GNC.

4.14.4 The design and documents of the crane shall be in accordance with CAP 548I, Merchant Shipping (Local Vessels)(Works) regulation, Hong Kong Shipping Ordinance, HKMD, Section 45 "Strength Calculation etc. in Respect of Cranes". All lifting gear and crane shall be tested with a proof load in accordance with the Schedule 1 of CAP 548I together with a valid "certificate of test and examination" provided. Details are to be discussed in the kick-off meeting.

4.15 Marine Growth Protection System

4.15.1 The Vessel shall be fitted with a marine growth protection system. The system is to produce copper ions in the water system to protect the pipeline/machinery systems from marine growth.

4.15.2 Within each sea strainer/sea chest, an anode shall be fitted. The anodes shall be controlled by a DC control panel which is to be controlled and managed by the Vessel engineer.

4.15.3 Each copper anode shall be suitably sized to suit the total flow rate of sea water through each strainer. This is to be calculated and the calculation shall be submitted for approval by GNC prior to installation.

4.15.4 Each anode shall be supplied with an integral nylon mounting arrangement and its own integral

cathode to ensure that currents are correctly controlled.

4.16 Lightning Protection

4.16.1 The Vessel shall be fitted with a lightning protection system, acceptable to the RO, to protect the persons onboard and the electronic equipment installed onboard.

4.16.2 The methodology and working principles of the lightning protection system shall be submitted to GNC for approval prior to installation. The lightning protection shall prevent lightning from striking vessel by neutralizing and de-ionizing electrical charges in the atmosphere as per IEC 62305 or equivalent.

4.16.3 The strength of lightning device and the supporting structures shall be properly designed. The possible dynamic inertia loads due to the motion of the Vessel in design waves as well as the gravity shall be considered in the design.

Chapter 5 Fire Safety Equipment

5.1 General Provisions

5.1.1 Engine room shall be enclosed by fire-resisting divisions complying with the requirements of the International Code for Application of Fire Test Procedures ("FTP Code"), as defined in Chapter II-2 of SOLAS.

5.1.2 All spaces onboard the Vessel shall be assessed in accordance with the 2000 HSC Code and RO Requirements in order to define the applicable level of structural fire protection. Spaces which likely require protection include but are not limited to the Vessel's engine room and supporting structures of the wheelhouse.

5.1.3 Fire-resisting bulkheads and decks shall be constructed to resist exposure to fire as per the 2000 HSC Code and RO Requirements for that specific location. The main load-carrying structures shall be arranged to distribute loads such that there will be no collapse of the construction of the hull and deckhouse when it is exposed to fire.

5.1.4 The hull, structural stiffeners, bulkheads, decks, deckhouses and pillars shall be constructed of approved non-combustible materials as required in the FTP Code and RO's requirements.

5.1.5 The arrangement of pipes, ducts and electrical cables penetrating the engine room's fire resisting division shall ensure that the fire-resisting integrity of the division is not impaired, and necessary testing shall be carried out in accordance with the FTP code.

5.1.6 All furniture shall be constructed entirely of approved non-combustible materials or fire restricting materials to meet the RO Requirements.

5.1.7 All upholstered furniture, curtains and suspended textile materials shall be manufactured to resist the propagation of flame in accordance with the FTP Code.

5.1.8 All deck, deck head and side panel finish materials shall comply with the FTP Code.

5.1.9 All the exposed surfaces and surfaces of bulkheads (including windows), wall and ceiling linings in all compartments shall be constructed of materials having low flame-spread characteristics as required in the FTP Code.

5.1.10 Any thermal and acoustic insulation fitted shall be a non-combustible or fire-restricting type material. Vapour barriers and adhesives used in conjunction with insulation, as well as insulation of pipe fittings for cold service systems when accepted by RO, need not to be non-combustible or fire restricting. However, they shall be kept to the minimum quantity practicable and their exposed surfaces shall have low flame spread characteristics.

5.1.11 Exposed surfaces in corridors, stairway enclosures, bulkheads (including windows), wall and ceiling linings in all compartments, shall be constructed of materials which, when exposed to fire, are not capable of producing excessive quantities of smoke or toxic products, this being determined in accordance with the FTP Code.

5.1.12 Signage in accordance with IMO Resolution A.654(16) shall be placed in appropriate locations to the satisfaction of GNC and HKPF with escape path illumination being provided.

5.1.13 Hose reels with attached fire hoses shall be installed on the main deck for ready-to-use condition with sufficient length to cover the length of the whole ship.

5.2 Fire Detection System

5.2.1 An approved automatic fire detection system, in accordance with the 2000 HSC Code and RO Requirements, shall be fitted on the Vessel.

5.2.2 The fire detection master control panel shall be located at the wheelhouse engine remote control console.

5.2.3 The fire detection system shall initiate audible and visual alarms which are distinct in both respects from the alarms of any other systems onboard that do not indicate fire. The alarms shall be of sufficient volume and distribution, so to ensure that the alarms are heard throughout the Vessel including all the machinery spaces and observed at the wheelhouse engine remote control console.

5.2.4 Fire detectors shall be installed in all compartments throughout the Vessel. The detection system is to consist of both heat and smoke detectors in accordance with the 2000 HSC Code and RO Requirements and to the acceptance of GNC and HKPF.

5.3 Fixed Fire-Extinguishing System for Machinery Spaces

5.3.1 Fixed Fire extinguishing system in the engine rooms shall be a fixed aerosol fire-extinguishing system or fixed FM200 fire-extinguishing system in complying with the applicable 2000 HSC Code and RO's requirements for engine rooms / machinery spaces protection.

5.3.2 The fixed fire-extinguishing system including the control station shall be protected from accidental activation. An audible and visual alarm shall be triggered once the system is accessed/activated. The sound and visual alarms shall be distinguished from other alarms. The sound and visual alarms shall be audible and visible in the wheelhouse e.g. engine rooms, and the other applicable machinery spaces.

5.3.3 The fixed fire-extinguishing system control station shall incorporate various designs/devices to ensure the following actions are properly completed in sequence before releasing:

(a) Shut-off the power supply to the fuel pumps, ventilation fans, air-conditioning system circulation fans, etc., and triggering an audible and visual activation alarm of the fixed fire-extinguishing system throughout the Vessel. This shall include but not be limited to the wheelhouse and spaces to be protected e.g. engine rooms, and the other applicable machinery spaces;

(b) Shut-off the fuel supply from the fuel tanks to the engines, and the outlets of any other oil tanks in the engine rooms, via quick-closing devices; and

(c) Close the fire dampers of the engine room ventilation system and the air-conditioning system if applicable.

5.3.4 The gas bottles for the system shall be stowed outside the space they are protecting, but if possible, close by to prevent the need for long pipe runs. The bottles shall be adequately protected from the external weather environment, and due consideration shall be given to the ventilation of the storage space. A forced mechanical ventilation system shall be provided if the storage space is located below the main deck.

5.3.5 The fixed fire-extinguishing system diagram shall be submitted to the RO for approval and subsequently to GNC prior to installation onboard the Vessel.

5.3.6 The designated protected area shall include those potentially high temperature areas (e.g. exhaust piping) with inherent fire risk caused by accidental oil splash.

5.3.7 The protection of fire-extinguishing personnel, in particular safety access and escape from the fire scene, shall be considered in the design of the system.

5.3.8 The designated protected areas shall be submitted to GNC and the HKPF for acceptance.

5.3.9 Further details of the arrangements and installations of the fixed fire-extinguishing system are to be discussed during the kick-off meeting.

5.4 Portable Fire Extinguishers

5.4.1 An adequate number of portable fire extinguishers compliant with Chapter 4 of the Fire Safety System Code ("FSS Code") and IMO Resolution A951 shall be provided to serve all compartments in the Vessel and be so positioned as to be readily available for immediate use. In addition, at least one (1) fire extinguisher of the relevant type for that particular space shall be positioned outside each entrance, including the engine room, and food preparation area.

5.4.2 Fire extinguishers shall be type-approved by the RO or meet other relevant international standards. Certificates shall be submitted to GNC before Delivery Acceptance.

5.4.3 In the wheelhouse and other spaces containing electrical or electronic equipment or appliances necessary for the safety of the Vessel, fire extinguishers shall be provided with extinguishing media, which are neither electrically conductive nor harmful to the equipment and appliances.

5.4.4 Fire extinguishers shall be ready for use and located in easily visible places such that they can be reached quickly and easily at any time in the event of a fire. Portable fire extinguishers shall be properly secured in place.

5.4.5 Portable fire extinguishers shall be provided with a mechanism to identify if they have been used.

5.5 Fire Pumps

5.5.1 At least one (1) fire pump, in addition to the external firefighting system specified in Paragraph 5.6.1, shall be provided. The arrangement of the fire pumps shall be so arranged in accordance with the RO Requirements to the satisfaction of GNC.

5.5.2 Each fire pump shall have sufficient capacity to pump water from a sea chest to deck hydrant with a capacity as required by the RO. The fire pump shall be controlled from the wheelhouse engine remote control console. The fire main and fire pump shall be designed and installed in accordance with RO's requirements and relevant regulatory body requirements. The spindles of manually operated valves shall be accessed easily and all valves shall be clearly marked.

5.5.3 The hydrant shall be supplied with a complete set of fire-fighting accessories including appropriate length of fire hose made of suitable material and spray/jet nozzle. The hose and nozzle shall be stowed inside a firebox located in the vicinity of the hydrant. All equipment shall be designed and installed in accordance with RO Requirements.

5.5.4 Two (2) jets shall be capable of being produced simultaneously to reach any position of the Vessel. The jet produced shall also reach the highest point of the vessel.

5.5.5 Hydrants shall be so arranged in accordance with the RO Requirements to the satisfaction of GNC.

5.5.6 A semi-rotary hand pump of brass casing shall be provided on deck for fire-fighting purposes. The pump shall be able to produce a flow jet of at least six (6) metres distance. The suction sea chest of the hand pump shall be fitted outside the engine room and the suction valve shall be operated by an extended spindle on deck. Installation shall comply with an RO's requirements.

5.5.7 A separate deck washing pipeline shall be provided from a fire main line at the discretion of GNC and HKPF.

5.6 External Fire Fighting System

5.6.1 General Overview

(a) A suitable marine type fixed External Fire Fighting System ("EFFS") shall be provided.

The system will consist of:

(1) One (1) electric fire pump with a minimum flow rate of 1,050 L/min and a pressure of 5.5 bars, suitable for both external and internal fire-fighting purposes.

(2) One (1) fixed water monitor with valves and pipes.

5.6.2 External Fire Pump

(a) The fire pump shall be equipped with independent sea suction and non-return valves to ensure optimal operation and reliability.

(b) Controls and instrumentation of the fire pump motor shall be designed for single-man operation from the deckhouse. The control console shall feature:

(1) Remote start and stop capabilities.

(2) Fault indicating lights and alarms.

(3) Protective devices and trips as recommended by the manufacturer.

5.6.3 External Fire Monitor

(a) One (1) electrically operated monitor, capable of remote control and manual operation, shall be installed in the forward section of the vessel. The monitor shall have:

(1) Vertical movement capabilities of -20° to +70°.

(2) Continuous rotation of 270°.

(b) All pipes, flanges, valves etc. in the piping system shall be made of a suitable grade of stainless steel or copper chrome plated material to avoid corrosion happening within expected ship life.

5.6.4 Control System

(a) All electrical devices in this External Fire Fighting System ("EFFS") located on the open deck shall meet a minimum IP56 rating to ensure durability in harsh marine environments.

(b) Remote control panel of the monitor of the EFFS shall be installed in the wheelhouse console. The position of the panel shall be determined and agreed by the HKPF during the design of the wheelhouse and shall be included in the mock-up.

(c) The system shall be powered by either 12V or 24V DC.

5.7 Fire Control and Safety Plan

5.7.1 The fire control and safety plan shall be framed and permanently displayed for the guidance of the ship's crew at the wheelhouse and at appropriate locations on the main deck, using graphical symbols in accordance with IMO Resolution A.654(16) as amended.

5.7.2 The contents of the fire control and safety plan shall meet the requirements of GNC and HKPF.

5.7.3 The text of the fire control and safety plan shall be in English and Traditional Chinese.

5.7.4 Details to be finalised in the kick-off meeting.

5.8 Additional Protection by Alarm System

5.8.1 When the Vessel is afloat and unmanned, the fire detection system, the bilge alarm system, and watertight door monitoring system shall continue to function. An external audible and visual alarm shall also be fitted at the top of the deckhouse to alert persons ashore for the situation.

5.8.2 The additional protection shall be capable of being turned on and off as required.

Chapter 6 Lifesaving Appliances ("LSA") and Arrangements

6.1 General Provisions

6.1.1 Lifesaving appliances shall be provided on the Vessel at appropriate locations in accordance with the RO's requirements.

6.1.2 Signage in accordance with IMO Resolution A.1116(30) as amended shall be placed in appropriate locations to the satisfaction of GNC and the HKPF.

6.1.3 Lifesaving appliances shall be of approved types conforming to the International Life-Saving Appliance Code ("LSA Code") adopted by the Maritime Safety Committee of the IMO by Resolution MSC.48(66) and approved by any one RO listed in Annex 9 to this Part VII.

6.1.4 A lifesaving arrangement plan approved by the RO, GNC and the HKPF shall be framed and permanently displayed in the wheelhouse and embarkation lobby. Symbols in accordance with The IMO Resolution A.1116(30) as amended shall be used.

6.1.5 Life jackets shall be so placed as to be readily accessible and their positions shall be clearly indicated.

(a) Inflatable life jackets for the crew of five (5), for everyday use, shall be provided by HKPF;

(b) Sixteen (16) common lifejackets (Developed common lifejacket for both adults and children MD Notice No.69 of 2019 refers) acceptable to MD are to be provided, for use by police passengers or casualties evacuated or rescued and travelling onboard the Vessel. These shall be stored in a locker;

(c) Lifejacket donning instructions shall be posted at suitable positions around the Vessel;

(d) All lifejackets are to be marked with the Vessel Name; and

(e) Twenty-one (21) thermal protection aids are to be provided by the Contractor.

6.1.6 Liferaft

(a) A liferaft shall be provided and installed in accordance with the LSA Code and RO requirements;

(b) Liferaft shall be fitted with a hydrostatic release. In addition, liferaft is to be installed with a quick deployment cradle such that one (1) person can manually deploy the liferaft(s) in adverse sea and weather conditions;

(c) Subject to RO's approval, one (1) 25-person liferaft, positioned in a cradle, shall be fitted onboard the Vessel; and

(d) Liferaft shall be marked with "Police" in both English and Traditional Chinese together with the Vessel Name.

6.1.7 In total four (4) lifebuoys shall be provided. Two (2) lifebuoys shall be provided with Man-Over-Board ("MOB") smoke markers and lights. Two (2) lifebuoys shall be with thirty (30) metres buoyant lines. All lifebuoys are to be marked "Police" in both English and Traditional Chinese together with the Vessel Name and reflective tapes.

6.1.8 Two (2) sets of personal recovery device (port and starboard) shall be provided for the recovery of persons from water and are appropriate for the size of the proposed vessel points fitted at the locations as required. Details shall be discussed at the kick-off meeting.

6.1.9 Two (2) Emergency Position Indicating Radio Beacons ("EPIRB") shall be provided and fitted onboard the Vessel and are to be mounted in the vicinity of the wheelhouse with float free capability.

6.1.10 Four (4) AIS Personal Locator Beacon ("PLB")/MOB transponders, with automatic activation and manual activation capability, are to be provided and mounted on a storage board. Two (2) transponders shall be positioned near the aft wheelhouse door and two (2) transponders shall be positioned near the side wheelhouse door. Transponders shall be readily available and shall be worn by crew when they are working on the open deck when underway. Each transponder shall be numbered so a missing crew member can be easily identified.

6.1.11 The Contractor will be responsible for the application for the Maritime Mobile Service Identity ("MMSI") numbers from the Office of the Communications Authority of Hong Kong ("OFCA").

Chapter 7 Machinery

7.1 General Requirements

7.1.1 The Contractor should note that the Vessel is for use within the Hong Kong Waters. The main diesel engines, gearboxes, diesel generators, waterjets (if any) and any other machinery offered by the Contractor, shall be commonly available in Hong Kong and shall have good availability of spare parts in Hong Kong. Good technical support and maintenance services by authorized local agents or service dealers shall also be available locally in Hong Kong on top of a competent local agent in Hong Kong to be appointed for performing the Warranty Services as detailed in Paragraph 1.1 of Annex 1 to this Part VII.

7.1.2 The Vessel shall be fitted with all machinery described in this Chapter 7 of this Part VII. The Spare Parts to be provided shall be of the same model as those equipment and machinery supplied for the Vessel and shall equally comply with all specifications set out in Chapter 7 of this Part VII.

7.1.3 One (1) means of access shall be provided to engine room. It shall be directly to the main deck. The design and the layout of the engine room shall be approved by the RO and agreed by GNC. The machinery with the associated piping systems and fittings relating to the main diesel engines and diesel generators shall be of a design and construction adequate for the intended purpose. It shall be so installed and protected as to minimise Occupational Safety and Health ("OSH") hazards to persons on-board. Due regard shall be paid to moving parts, hot surfaces and other hazards. The design shall consider the materials used in Vessel's construction, the purpose of the equipment, the working conditions to which the equipment will be subjected to regarding the onboard environmental conditions. Cushioning / impact protections shall be provided on the overhead cable trunks for preventing crew head injuries.

7.1.4 Sufficient space in the vicinity of the machinery for inspection and routine maintenance for all the machinery shall be provided. Procedures and sequences for complete removal of the major items, such as the main diesel engines, gearboxes, diesel generators etc. shall be carefully designed and provided. This shall enable their removal from the Vessel for maintenance in a practicable manner with a view to avoiding the need for cutting the deck, the deck house or shell plates.

7.1.5 All parts of machinery, hydraulic, control and other systems and their associated fittings with internal pressure shall be subject to appropriate tests including a pressure test before being put into service for the first time.

7.1.6 Provision shall be made to facilitate cleaning, inspection and maintenance of the main diesel engines, diesel generators, fire pumps, etc. and their associated piping and equipment.

7.1.7 Oil filters, dipsticks and fuel filters shall be positioned to allow easy access for maintenance and repair. In addition, drip trays shall be provided at service points to prevent leaked fluids from spilling into the Vessel's bilges.

7.1.8 Lifting brackets and lifting gear for moving heavy equipment shall be provided at appropriate locations in the engine room and other locations as deemed necessary. The lifting capacity with its Safe Working Load ("SWL") shall be marked after a load test was conducted to GNC's satisfaction. The Contractor shall provide the specially made tools and/or temporary structures, as needed, to facilitate the moving/removal of heavy equipment.

7.1.9 The machinery installation shall be suitable for operation as in an unmanned machinery space. An unmanned duty alarm system shall be provided. The monitoring and controls, including automated fire detection system, bilge alarm system, remote machinery instrumentation and alarm system shall be centralized in the wheelhouse Engine Remote Control.

7.1.10 All emergency stops shall be fitted with protective guards to prevent inadvertent use.

7.2 Main Propulsion Engines

7.2.1 The Vessel shall be equipped with two (2) or three (3) electrically started, fresh water cooled marine diesel engines (alternatively referred to as "main propulsion engines" or "main engines") of adequate power for the Contract Speed. The rating of the engines for the Vessel shall fit the operational profile as stated in Paragraph 2.7.2 of this Part VII. The diesel engines shall meet IMO Tier II emission requirements without NOx after-treatment. **[E]**

7.2.2 A type approval certificate issued by any one RO listed in Annex 9 to this Part VII but not necessarily the RO specified in Schedule 9 of Part V or other entities acceptable to GNC showing that the proposed model of marine main diesel engines complies with the IMO Tier II emission requirements as specified in paragraph 7.2.1 above, as well as the Engine International Air Pollution Prevention ("EIAPP") Certificate with supplement issued by the same aforesaid RO and supporting Technical File approved by that same RO or diesel engine over 130kW (appropriate test cycle to suit the proposed diesel engine's application in accordance with Chapter 3 of the NOx Technical Code 2008, as amended should be stated in the EIAPP certificate) shall be provided.

7.2.3 General features of the Main Engines ("M/E"):

(a) The main engines shall be marine diesel engines of proprietary make, electrically started by 24 Volt-DC, and shall have integral fresh water/sea water heat exchangers, fresh water pump, sea water pump, LO pump, fuel lift pump (if required), FO filters, LO filters, Centrifugal Oil Filters, engine-mounted instrumentation panel with essential gauges and protective devices, and any other ancillary equipment and fittings as recommended by the engine manufacturer for the efficient operation of the engines;

(b) Flexible mounting shall be used to contain the noise levels in crew spaces and not to exceed 80 dB(A);

(c) An engine-mounted charging alternator, with a capacity of not less than 60 amperes and with built-in voltage regulator, shall be provided on each M/E for charging their respective starting batteries;

(d) The design of the main diesel engines and its control systems shall have been approved by one of the RO listed in Annex 9 to this Part VII;

(e) The engine aft end shall be connected to the waterjet units via a gearbox through a flexible coupling;

(f) To facilitate LO renewal, a suitable hand pump connected to the LO sump shall be provided for each diesel engine so that LO can be drained from the lowest point of the engine LO sump;

(g) The main diesel engines shall drive the waterjet impellers through reduction gears;

(h) The main diesel engines' exhausts and silencers shall be insulated and protected according to the requirements of the RO as the hot surface presented as a risk to the onboard personnel and minimise the heat transfer into the machinery space. All components of the exhaust system shall be mounted or suspended by hangers which shall not transmit heat, noise or vibration to the Vessel's structure. The exhaust outlets shall meet the requirements of the RO. Expansion bellows shall be provided;

(i) The minimum number of engine hours before the first major overhaul for each of the main diesel engines since new shall not be less than 5,000 engine hours per main diesel engine and the same minimum time shall apply each subsequent overhaul;

(j) The main diesel engines shall be capable of operation on diesel complying with specifications set out in Cap. 311L, Schedule 1 – Air Pollution Control (Motor Vehicle Fuel) Regulation of the Laws of Hong Kong; and

(k) The main diesel engines shall be capable of operating on B5 Diesel (5% biodiesel) complying with the specification in Annex 13 to this Part VII.

7.2.4 Engine Performance:

(a) The estimated engine propulsive power with all main diesel engines running together with the waterjet propulsion system for attaining the Contract Speed of the Vessel under the Official Speed Trial conditions as stated in Paragraph 1 of Annex 5 to this Part VII, together with a descriptive account of the engineering principles and methodology employed for such propulsive power estimate and evaluation shall be provided by the Tenderer. The Tenderer shall also submit the estimated speed-power requirements and characteristic curves of the propulsion system for the Vessel to support its claim for the achievable Contract Speed of at least forty-five (45) knots at 95% MCR; [E]

(b) The manufacturer's full power shop trial certificate for a continuous running test at full load for four (4) hours for each main diesel engine must be submitted to GNC before the official sea trial as part of the Technical Acceptance;

(c) The governor control of the engine shall be capable of proper control, when the engine is suddenly unloaded from a fully loaded condition as the seawater suction of waterjet units suddenly emerge out of water; and

(d) The main diesel engines shall always be in a standby mode and shall be pre-lubricated.

7.3 Main Diesel Engine Control

7.3.1 The controls and instrumentation of the main diesel engines shall be designed for operation with an engineer at the wheelhouse Engine Remote Control. The control console shall be ergonomically laid out and grouped. Details of the instrumentation and controls are listed in Paragraph 4.2.12 of this Part VII.

7.3.2 The design and installation shall follow the RO and IMO requirements and, where applicable, also comply to the IMO 2000 HSC code requirements.

(a) For the avoidance of doubt the following requirements shall also be met:

(1) Instrumentation and control systems for the main and auxiliary machinery shall be designed for unmanned machinery space operation;

(2) The wheelhouse engine remote control console in wheelhouse shall be designed for one-man operation. The control console and control box shall centralise all the instrumentation and control devices for the remote operation of the main engines and major machinery on board;

(3) All Local Operating Panel ("LOP") controls shall be operative in the Vessel's "deadship" condition, i.e. when there is no AC electrical power supply for the whole Vessel;

(4) The LOP for each engine shall be situated close to each engine for convenient engine-side control;

(5) The monitoring probes and sensors fitted to the main and auxiliary machinery shall be of a type-approved by any one RO listed in Annex 9 to this Part VII. These units shall be the sources of signals for the control consoles, LOP gauges and communication panels. If a LCD display is used for the system, it shall be easily seen by the operator; and

(6) All rescue and berthing controls shall be controlled from the wheelhouse.

(b) The following instrumentation and control devices shall be provided at the wheelhouse

engine remote control console:

(1) Start/stop keys or push buttons which shall be fitted with guard covers and running/stop indication lamps for each of the main diesel engines;

(2) A RPM control device for each of the main diesel engines;

(3) Clutch control and on/off indication devices for each of the clutches used in the propulsion system;

(4) Engine tachometers with running hour meter;

(5) Sea water cooling pressure;

(6) Coolant water temperature and pressure;

(7) Engine lubricating oil temperature and pressure gauges;

(8) High cooling water temperature alarm;

(9) Engine low lubricating oil pressure alarm and trip;

(10) Engine exhaust gas pyrometer;

(11) Overspeed alarm and trip;

(12) Real-time fuel flow rate; and

(13) Any other instrumentation recommended by the engine maker.

7.3.3 Standard manufacturer's local control panels shall be fitted in the engine rooms.

7.4 Diesel Engine Electric Generator Sets (Diesel Generators)

7.4.1 Two (2) electrically started and fresh water-cooled diesel generators of brushless self-excitation and ventilated type compatible with the design of the power distribution system as stated in Paragraph 8.2 of this Part VII shall be installed. The rating of the engines of the diesel generators shall be for Unrestricted Continuous Operation and the alternator shall have 10% overload capability for not less than fifteen (15) minutes of time. Synchronizing operation is required. **[E]**

7.4.2 Type approval certificates issued by any one RO listed in Annex 9 to this Part VII or other entities acceptable to GNC, showing the proposed model for the diesel generators' compliance with IMO Tier II emission requirements without NOx after-treatment, shall be provided, except that it is not required when each diesel engine electric generator's output power is less than 130 kW.

7.4.3 The diesel generators installed on the Vessel shall be capable of operation on diesel complying with the specifications set out in Chapter 311L Schedule 1 – Air Pollution Control (Motor Vehicle Fuel) Regulation of the Laws of Hong Kong.

7.4.4 Each diesel generator operating on its own and at its continuous service rating shall have sufficient capacity for:

(a) Supplying the full operational electrical load of the whole Vessel (including air-conditioning system) of the Vessel plus 15% reserve power; and

(b) Starting of the largest motor without causing any motor to stall or any other device to fail due to excessive voltage drop of the system.

7.4.5 Two (2) diesel generators shall be capable of working in parallel.

7.4.6 Electrical load analysis and calculations shall be provided and acceptable to GNC. The Tenderer shall provide this information in the Table of Schedule 7 as part of the tender evaluation during tendering stage.

7.4.7 The exhausts from diesel generators shall be equipped with a silencer to reduce the noise levels:

(a) All components of the exhaust system shall be mounted or suspended by the hangers which shall not transmit heat, noise or vibration to the Vessel's structure. The exhaust outlets shall meet the requirements of the RO. Expansion bellows shall be provided;

(b) The exhaust systems shall be designed appropriately to comply with the diesel generator and exhaust manufacturers' requirements. The diesel generator exhaust system shall be arranged to provide reasonable access to engine room machinery;

(c) RO approved expansion bellows shall be used; and

(d) Flexible sound reduction lagging for exhaust pipe works shall be based on the manufacturer's/appropriate industrial standard and meet the lagging/noise control requirements.

7.4.8 The design and installation of diesel generators, switchboard and associated wiring shall be in accordance with the RO Requirements as well as the following:

(a) Each diesel generator shall be provided with a type approval certificate from any one RO listed in Annex 9 to this Part VII confirming compliance with Paragraph 7.4.2 of this Part VII;

(b) Each diesel generator shall be resiliently mounted; and

(c) The arrangement of electrical and piping systems shall allow quick dismantling and replacement of the unit.

7.4.9 The diesel generators shall be capable of operating on B5 Diesel (5% biodiesel) complying with the specification in Annex 13 to this Part VII.

7.5 Diesel Generator Control

7.5.1 The controls and instrumentation of the diesel generator shall be arranged at the wheelhouse engine remote control console. The instrumentation in the consoles shall be comprehensively displayed on the multi-function displays and shall include but not be limited to the following information:

(a) RPM;

(b) Running hours;

(c) Cooling water temperature;

(d) Cooling water flow/pressure;

(e) Exhaust gas temperature;

(f) Lubricating oil pressure;

(g) Battery charger ammeter;

(h) Fault indicating and alarms;

(i) Protective functions such as over speed, low lubricating oil pressure and other functions as required by the engine manufacturer, RO and GNC;

(j) Any other parameters and protective functions recommended by the engine manufacturers; and

(k) A standard manufacturer's local control panel shall be fitted in engine room.

7.6 Instrumentation and Control

7.6.1 The wheelhouse engine remote control console is to be provided with comprehensive instrumentation and control for remote operation and monitoring of the main diesel engines and other auxiliaries to facilitate unattended engine room operations.

7.6.2 One (1) fire detector panel and one (1) engine room fixed fire extinguishing system panel shall be installed at the engine control consoles in the wheelhouse.

7.6.3 All the instruments such as temperature sensors, pressure sensors, level gauges, etc. shall have type approval certificates issued by any one RO listed in Annex 9 to this Part VII. The Contractor shall provide copies of the type approval certificates to GNC before the Delivery Acceptance.

7.6.4 All indication lights and the illumination of instrumentation gauges fitted on the consoles in the wheelhouse shall be fitted with dimmers for both day and night time operation.

7.6.5 Emergency stopping functions for the main diesel engines shall be provided at the wheelhouse engine wheelhouse engine remote control console.

7.7 Reduction Gearboxes

7.7.1 Each of the reduction gearboxes shall be properly mounted to the ship structure and shall be equipped with clutches, alarm sensors, and switches.

(a) Each reduction gearbox shall include the following:

(1) A flexible coupling of a well-known proprietary make;

(2) Built-in gear type oil pump;

(3) Low oil level alarm;

(4) High oil temperature alarm;

(5) Higher oil temperature cut out; and

(6) Heat exchanger.

(b) Gearbox oil heat exchangers shall be mounted on the reduction gearbox and piped to the engine cooling circuits as specified by the manufacturer;

(c) Reduction gears shall be sized to provide both low and high-speed performance; and

(d) Repeated cycling of the clutches in and out of gear is not permitted in any case to obtain low speed operation (i.e. five (5) knots speed in loitering).

7.7.2 The gearboxes shall be provided with alarms for low oil level and high oil temperature. Alarms shall be repeated both locally and at the remote control station as required.

7.7.3 Sufficient spaces at the engine side for maintenance and repair shall be required.

7.7.4 The gearboxes shall be supplied with a type approval certificate from any one RO listed in Annex 9 to this Part VII.

7.8 Waterjet Propulsions System and Control System

7.8.1 The design and installation shall follow the RO and the IMO requirements and, where applicable, shall also comply with the IMO 2000 HSC code requirements.

7.8.2 For the avoidance of doubt, the following requirements shall also be met:

(a) The waterjet propulsion system shall be installed in accordance with the engine maker's instructions and RO's requirements.

(b) The Vessel shall also be provided with the following items:

(1) The design of the whole waterjet propulsion system and the control system shall be of a patent design approved by any one of the ROs set out in Annex 9 to this Part VII;

(2) The RO's design and construction inspection certificates for the waterjet propulsion units shall be submitted to GNC before the Delivery Acceptance;

(3) The waterjet propulsion system shall be installed in accordance with manufacturer's instructions as well as the RO's requirements; and

(4) Torsional vibration calculations approved by the RO for the shafting system shall be provided to GNC before the Delivery Acceptance.

7.8.3 The Waterjet Propulsion Units

(a) General Requirements

(1) One (1) waterjet unit shall be driven by one (1) main diesel engine through one (1) reduction gear and flexible coupling. There shall be a total of two (2) or three (3) waterjet units.

(2) The waterjet propulsion system controlling and monitoring both waterjet units shall include the following alarms with individual warning indications at the wheelhouse engine remote control console:

(i) Control system power failure;

(ii) Alarm system power failure;

(iii) Lubricating oil tank low level (if provided);

(iv) Lubricating oil pressure low (if it is a forced lubricating oil system);

(v) Low hydraulic oil pressure;

(vi) Station keeping control device;

(vii) Safety system power failure; and

(viii) The waterjet units shall be made of corrosion resistant materials and that the whole system shall be well insulated and arranged to prevent galvanic corrosion.

(b) Grates shall be provided across the area at the water intake to discourage sticks and other debris from entering the water intake. The grates must be affixed at each end;

(c) The Control System (Speed and Manoeuvring/Reverse Control) shall be provided;

(d) Controls and instruments for the main diesel engines and waterjet units shall be designed for a one-man operation of all units in the wheelhouse engine remote control;

(e) Built-in propulsion-station keeping function as per paragraphs 7.8.5 of this Part VII shall be provided; and

(f) Back-up Control System

(1) The back-up system shall be completely separated all the way from the wheelhouse down to the water-jet units;

(2) The back-up system shall be capable of being used immediately if a fault occurs in the main system;

(3) The switch-over shall not be automatic but controlled by the coxswain with the selector button situated in the vicinity of the back-up levers;

(4) All manoeuvring actions performed by the main system shall be capable of being performed by the back-up systems; and

(5) Training for the use of this back-up control system, including steering and reversing, shall be provided by the Contractor to GNC and HKPF designated officers.

7.8.4 Emergency Steering

(a) The Vessel shall be designed so as to remain safely controllable in event of any loss of control functions;

(b) The Vessel shall be capable of being manoeuvred under reduced speed by directly operating the emergency steering system located in jet room/aft peak compartments;

(c) The forward/reverse and steering operations of the Vessel shall be carried out directly after the system is changed over to the emergency steering control;

(d) The instrumentation and alarm panel for the waterjet system shall contain all the essential instrumentation and alarm devices for the effective monitoring and control of the waterjet units;

(e) Communication between emergency steering positions and other stations shall be provided; and

(f) Steering angle and reverse angle indication shall be provided in the jet room.

7.8.5 Propulsion-station keeping

(a) The waterjet control system shall built-in with the station keeping function, and be capable of maintaining the ship's heading and positioning when switching on the station keeping function;

(b) The station keeping function shall automatically hold the Vessel in a predetermined position and heading by controlling the speed (RPM) of the Vessel’s waterjets and adjusting the jet stream angles of the waterjets;

(c) A control panel and controllers shall be fitted at the wheelhouse control station and its location to be determined by HKPF. The positions of the station keeping control device and its display are to be determined and agreed by the HKPF during the design of the wheelhouse and shall be included in the mock-up inspection; and

(d) The relevant capacity calculation of the station keeping function should be provided from maker during the design stage and the Contractor should submit it to HKPF and GNC for acceptance.

7.9 Engine Room and Other Machinery Spaces Ventilation

7.9.1 The machinery space ventilation system shall be designed to the satisfaction of RO and GNC.

7.9.2 This system shall provide sufficient air to the engines and shall provide adequate protection against damage due to ingress of foreign matter.

7.9.3 The air supply inlets shall be connected to louvers designed to effectively prevent ingress of water during extreme sea states and weather conditions. The fire dampers of the vents shall be capable of being remotely and locally controlled. The coaming of the vents shall be of adequate height.

7.9.4 The engine room shall be adequately ventilated even when machinery are operating at full power in all sea and weather conditions, including heavy sea and adverse weather during a typhoon. An adequate supply of air shall be maintained to the compartments for the safety of personnel and

the normal operation of the machinery.

(a) All spaces containing machinery shall be provided with forced ventilation and the design shall be such that any hot spots or "dead air" areas are avoided; and

(b) All ventilation ducts, intakes and outlets shall be sized to minimize pressure drops and noise from air-flow. For design purposes, air flow rates in ducting shall be kept to 10m/s or less. Airflow rates at vents and louvres shall be as low as required to avoid noise from air-flow (Typically 5m/s depending on vent or louver design).

7.9.5 Waterjet unit compartments/jet rooms and tank space(s) shall be provided with forced ventilation. The ventilation arrangements shall be adequate to ensure that the safe operation of the Vessel is not compromised.

7.9.6 As a guidance, the ventilation air to the compartment as stated shall limit the temperature rise in a machinery space to 10°C above the ambient temperature.

7.9.7 As the prime movers draw combustion air from within the compartment, the total ventilation air shall be based on ISO Standards for Shipbuilding in Air-conditioning and Ventilation of spaces in ships (e.g. ISO 7547 & ISO 8862) as a minimum but shall not be less than that required for combustion plus 50%. The ventilation air shall be determined in accordance with the manufacturer's prescribed requirements to the satisfaction of GNC.

7.9.8 Automatic shut-off devices shall be provided according to the RO Requirements when the fixed fire extinguishing system is to be activated.

7.9.9 Calculations for the capacity of the fans to meet the minimum air changes requirements shall be submitted to the RO for approval.

7.10 Air-Conditioning System

7.10.1 One (1) air-conditioning system shall be provided. The air conditioning system shall be a central sea water cooled chiller type. It shall incorporate two (2) modular compressors, a cooling sea water pump, two (2) interchangeable sea water filters and a chilled water circulating pump to distribute chilled water to individual temperature controlled fan coil unit. Apart from the cooling sea water pump, alternative pumps, such as the GS pump, shall be able to support the air-conditioning system when needed. The flow of each sea water filter shall be sufficient to cool the whole air-conditioning system. Any one (1) of the modular compressors shall have sufficient capacity to supply the air-conditioning for the whole vessel according to the calculated cooling load, which shall ensure that the temperature and humidity within the wheelhouse is maintained at the following levels:

	Value	**Notes**
External Air Temperature	40°C	85% relative humidity
Internal Air Temperature	21°C	60% relative humidity

This system shall be sufficient for five (5) crew members and sixteen (16) police officers onboard. An acceptance test of the complete system shall be carried out to verify the effectiveness of the system and that such as in compliance with the requirements set out in Part VII.

7.10.2 The refrigerant shall be CFC and HCFC free.

7.10.3 Emergency stop switches for the system in addition to the normal power "on/off" switches shall be installed at the wheelhouse engine remote control. The emergency stop switches shall be automatically activated when the fixed fire extinguishing system is to be triggered.

7.10.4 Mould and bacteria resistant replacement filters shall be fitted at air inlets.

7.10.5 The fan coil blower units within the wheelhouse shall be carefully located for efficient operation, as recommended by the air-conditioning manufacturer, with due consideration being given to the air moisture levels in the sea environment. Condensation drains are to be fitted and routed directly overboard. The location of all such equipment shall be accepted by GNC and the HKPF prior to installation onboard.

7.10.6 Sufficient ventilation shall be provided in case of air-conditioning breakdown.

7.10.7 All air-intakes shall be located away from the machinery exhausts to maintain the on-board air quality.

7.11 Piping System

7.11.1 Piping connections and joints shall be constructed and designed in accordance with the RO's requirements. Pipe bends should be kept to a minimum in number and shall have sufficiently large radii to facilitate a smooth flow.

7.11.2 The piping material shall be marine grade 316L stainless steel or equivalent agreed by the HKPF and GNC. The thickness and material shall be acceptable to the RO.

7.11.3 All pipes shall be secured in position to prevent chafing or lateral movement. Long or heavy lengths of pipe shall be supported by bearers, so that no undue load is carried by the pipe connections, pumps or fittings to which they are attached. Proper insulation shall be applied to avoid galvanic corrosion.

7.11.4 Suitable provision for expansion shall be made, where necessary.

7.11.5 Where expansion pieces are fitted, arrangements shall be provided to protect against over extension and compression. The adjoining pipes shall be suitably aligned, supported, guided and anchored, where necessary, expansion pieces of the bellows type shall be used to protect the system against mechanical damage.

7.11.6 As far as practicable, pipelines, including exhaust pipes from engines, are not to be routed in the vicinity of switchboards or other electrical appliances in positions where the drip or escape of fluids or gas from joints or fittings could cause damage to the electrical installation.

7.11.7 Watertight bulkheads, decks or structural members having pipeline penetrations shall be designed and installed in accordance with the RO's Requirements. Watertight and structural integrity must be maintained and approved by the RO and to the satisfaction of GNC.

7.11.8 The material of gaskets shall be capable of resisting chemical attack from the fluid being conveyed. Means to prevent galvanic corrosion shall be provided if different materials are used in the system.

7.11.9 All piping and equipment shall be labelled and colour-coded. Each pipe running through each compartment shall be colour-coded, labelled and have the direction of flow marked, in at least two (2) places. Colour coding of machinery and piping shall be in accordance with ISO 14726:2008.

7.12 Fuel Oil System and Fuel Oil Tank

7.12.1 As Government vessels are committed to utilize sustainable/renewable fuel blends, the propulsion engines and the diesel generators of the Vessel shall be able to use diesel complying with the specifications set out in Chapter 311L Schedule 1 – Air Pollution Control (Motor Vehicle Fuel) Regulation of the Laws of Hong Kong, which contains a fatty acid methyl ester content up to 5%.

7.12.2 The fuel oil system shall be designed that condensation of water and foreign objects are prevented from entering the system as far as possible. Moreover, prevention of "Diesel Bug" shall also be taken into account in the design of fuel oil system and fuel tanks.

7.12.3 The fuel oil of the main diesel engines and diesel generators shall be supplied from one or more fuel oil tanks. The Contractor is free to design the number and location(s) of the fuel oil tank(s) to fulfil the specific requirements. The arrangement is to be submitted to the RO and GNC for approval prior to construction and installation onboard the Vessel.

7.12.4 Quick closing valves (controlled from the main deck) shall be fitted to the fuel oil tank outlets along with drip trays.

7.12.5 The system design and filtration systems shall be approved by the main diesel engine and diesel generator manufacturers.

7.12.6 The tanks shall be tested according to the RO requirements and witnessed by the RO and GNC.

7.12.7 An electric motor-driven pump shall be provided for transferring fuel between tanks.

7.12.8 An independent fuel transfer pump with a controllable flow rate up to 200 litres/min and associated pipelines extended to the main deck shall be provided, in order to transfer fuel out of the vessel, if needed. Details shall be discussed at the kick-off meeting.

7.12.9 All materials used in fuel systems shall be resistant to deterioration from the designated B5 diesel and other liquids or compounds with which it may come into contact under normal operating conditions, e.g. grease, lubricating oil, bilge solvents and sea water.

7.12.10 The filling pipe shall be of a metallic construction and be a permanent fixture from the main deck and secured to the tank. A coloured screwed cap and name plate inscribed 'Fuel Oil' together with Chinese '燃油' shall be provided at the filling point. Flexible hoses are not permitted as filling pipes.

7.12.11 Duplex filter sets shall be fitted in the fuel supply lines to each of the main engines and diesel generators. The arrangements shall be such that any filter can be cleaned without interrupting the supply of filtered fuel oil to the engines.

7.12.12 Water separators with drains shall be fitted to each fuel supply line to the engines.

7.12.13 The material and design of the fuel piping system shall meet the RO requirements.

7.12.14 Fuel Oil Tanks

(a) Independent fuel oil tanks shall be arranged to allow Vessel operation at an acceptable trim in all loading conditions and shall consider the requirements of good static and running trim;

(b) The tank plate thickness shall sustain the loads due to the mass of the full tank with due consideration given to acceleration forces caused by the Vessel's movements at all speeds at sea, without damaging the tank and ship structure;

(c) Internal surfaces of the fuel oil tank shall be left unpainted and shall be cleaned thoroughly to the satisfaction of GNC;

(d) The tank(s) shall be installed so that the loads due to the mass of the full tank(s) are safely transmitted into the Vessel structure. The tanks shall not be directly adjacent to any other tanks carrying liquid of any kind;

(e) Requirements of the tank:

(1) A tank contents level gauge in litres and low-level alarm shall be fitted at the wheelhouse control station and the wheelhouse engine room remote control console;

(2) A high-level alarm is also to be fitted;

(3) The following shall be provided for each tank;

(i) Rigid fuel suction pipe intake with appropriate clearance to the tank bottom in accordance with the RO's requirements;

(ii) An inspection hatch;

(iii) Air vent with a hydrophobic filter and flame trap on deck;

(iv) Remote quick closing device operated at the fixed fire-fighting control station (from the main deck);

(v) A drain pipe with self-closing valve/cock;

(vi) Drip traps underneath the drain valve/cock, fuel filter and water separator;

(vii) Sounding pipes with aluminium alloy doubler welded on the bottom of the tank, self-closing device and a chained cap; and

(viii) Tank drain plug at a location as low as practically possible within the fuel oil tank(s).

(f) Fuel oil sloshing in the tanks shall be minimised and trapped vapour or airlocks shall be avoided;

(g) The fuel oil tank(s) shall be tested by a head of water equal to the maximum to which the tank may be subject, but not less than 2.5m above the top of the tank. The static test pressure shall be applied for five (5) minutes without pressure drop. After the test, the tested fuel tank shall present neither leakage nor deformation. The test is to be witnessed by the RO and GNC; and

(h) The compartment or space containing the fuel oil tank shall be fitted with two (2) ventilating pipes in an arrangement acceptable to the RO and GNC.

7.13 Fresh Water System

(a) Fresh Water Tank Arrangement:

(b) One (1) independent fresh water tank with a total capacity of not less than 300 litres shall be arranged in the Vessel to supply fresh water to the main deck, crew spaces; and

(c) The fresh water tank should be installed in the under-deck compartment space as designed by Contractor according to the RO's requirements.

7.13.2 The fresh water shall be supplied by a fresh water pump to achieve a stable pressure at the taps to GNC's satisfaction. The system shall provide potable fresh water throughout the Vessel. Cold freshwater taps with PVC braided/reinforced transparent hoses shall be fitted to locations to provide a rinse off facility for cleansing purposes and shall be to the satisfaction of GNC and the HKPF.

7.13.3 The fresh water tank shall be flushed clean before installation and delivery of the Vessel. The tank shall be tested by a head of water equal to the maximum to which the tank may be subjected to, but not less than 2.5m above the top of the tank. The static test pressure shall be applied for five (5) minutes without pressure drop. After the test, the tested fresh water tank shall present neither leakage nor deformation. The test is to be witnessed by the RO and GNC.

7.13.4 The fresh water tank shall be designed to be easily accessible for maintenance. It shall also be arranged with its own filling and vent pipes and with gauze to prevent ingress of material/contaminants to the tank. The freshwater tank shall be fitted with the following:

(a) Inspection / cleaning access cover;

(b) Filling pipe with padlocked cap;

(c) Vent pipe; and

(d) A tank content level gauge in litres and low-level alarm at fifty (50) litres, shall be fitted at the wheelhouse engine remote control console.

7.13.5 The tank shall be installed so that the loads due to the mass of the full tank(s) are safely transmitted into the Vessel structure. The tank shall not be directly adjacent to any other tanks carrying liquid of any kind.

7.13.6 The tank shall sustain the loads due to mass of the full tank with due consideration given to accelerations caused by the Vessel's movements at all speeds at sea without damaging the integrity of the tank and the Vessel's structure.

7.13.7 The fresh water pump shall be provided with a starter, pressure switch, pressure gauge, relief valve and suction valves. Accumulator shall be fitted in the system to keep stable the system pressure automatically.

7.13.8 Domestic fresh water piping shall be made of copper or 316L stainless steel. Certification for the piping material shall be submitted before the delivery of the Vessel. The welding joints of the domestic fresh water piping's shall be free from lead. The domestic fresh water from the fresh water tank shall be free from any substance harmful to health and shall comply with the Government requirements for domestic water. Drinking water filters accepted by GNC shall be provided at the tap in the food preparation area. A legionella test is to be carried out to the satisfaction of GNC prior to Delivery Acceptance.

7.14 Bilge System

7.14.1 The Contractor shall come up with a design of the bilge system to deal with the potential oily bilge in the machinery compartments (engine room, fuel tank compartments if application, and water jet room, etc.) and bilge in the other under compartments, with a bilge holding tank for oily bilge. The Vessel shall be fitted with a bilge system designed and installed in accordance with the RO's requirements.

7.14.2 A bilge audible and visual alarm panel shall be fitted in the wheelhouse engine remote control console covering all underdeck watertight compartments.

7.14.3 When the Vessel is afloat and unmanned, the bilge alarm system shall continue to function. When the audible and visual alarm is not acknowledged after a period of five (5) minutes, the audible and visual alarm shall be extended externally to on-shore command stations and other locations as requested by the HKPF. In addition, the audible and visual alarm shall be extended externally to an audible and visual alarm fitted on the top of the Wheelhouse to attract the attention of persons ashore. The system shall be powered by 24V from DC power source.

7.14.4 One (1) individual removable immersible pump with cable connected to the battery shall be provided.

7.14.5 All bilge system pipework shall be made of stainless steel 316L and shall be designed and installed in accordance with the RO's Requirements to the satisfaction of GNC.

7.14.6 An emergency bilge suction inlet shall be fitted to the sea water pump with the largest capacity in the engine room to the satisfaction of the RO and GNC.

7.15 Seawater System

7.15.1 All seawater valves shall be compatible with the aluminium hull material.

7.15.2 Separate sea chests shall be provided for the main diesel engines and diesel generators if needed. The sea chests shall be installed in the vicinity of their respective seawater pump suctions but with adequate distance between each other to avoid water flow disturbance. Further, the location of the sea chest shall minimize the chance of entraining air while the Vessel responds to heavy weather and adverse sea conditions.

7.15.3 Seawater piping shall be constructed of marine grade 316L stainless steel, copper-nickel alloy or other equivalent materials, in accordance with the RO's Requirements and to the satisfaction of GNC. A suitable strainer with isolation valves and air vent shall be fitted to each seawater system. Due consideration shall also be given to the provision of quick and easy access to the seawater strainers.

7.15.4 Cathodic protection and marine growth protection system are to be installed as detailed in Paragraphs 3.4 & 4.17 of this Part VII.

7.16 Sanitary, Grey and Black Water System

7.16.1 There is one (1) toilet located in the crew space. The toilet shall use fresh water for flushing.

7.16.2 One (1) black water holding tank with capacity of not less than 500 litres shall be provided.

7.16.3 Fresh water impressed unit supply fresh water to sanitary services.

7.16.4 Vacuum toilet system shall be arranged to collect the grey and black water from toilet, sink and urinal to black water holding tank and directly overboard in emergency. Two (2) vacuum pumps shall be provided, one (1) running, the other standby.

7.16.5 The black water holding tank shall be fitted with a level gauge and a "Tank Full" indicator installed in a highly visible location in the wheelhouse.

7.16.6 The design of the vacuum toilet system shall be agreed and acceptable to GNC before installation.

7.16.7 A discharge macerator electric pump shall be provided for pumping out the contents of the black water holding tank. This shall be primarily lead to the shore connection, but shall also be arranged with a backup direct overboard discharge via non-return valve. The shore connection shall be arranged with an international shore connection.

7.16.8 Sanitary, grey and black water piping shall be made of stainless steel 316L.

7.17 Open Deck Drainage System

7.17.1 The Vessel shall be fitted with an open deck drainage system to the RO's requirements.

7.17.2 Scupper piping is to be constructed of marine grade aluminium alloy. Means shall be provided to avoid any possible galvanic corrosion. Sufficient scuppers to efficiently remove deck washing water shall be provided.

7.18 Floor Plates, Handrails and Guards

7.18.1 The floor of the engine room and jet room shall be covered with aluminium checker plates, which shall be properly secured but easily removable for safe operation. Proper insulation shall be applied to avoid galvanic corrosion. Suitable damping arrangements shall be provided for plates to avoid generation of rattling noise.

7.18.2 For easy maintenance, floor plating shall be easily removable to facilitate access to the bilges, pumps, shaft, pipework and strainers. Removable access plates shall be fitted to provide access

to valves.

7.18.3 All boundary bars, handrails, gratings, ladders, platforms, stanchion and vertical supports in the engine room and jet room shall be of lightweight construction and fulfil the requirements of the Code of Practice for HK Local Vessels.

7.18.4 Removable guards for the protection of personnel and machinery shall be provided over exposed moving parts of the machinery, hot pipe work, etc.

7.18.5 Splash plates, casings, fenders, screens, etc. shall be provided for the protection of personnel and machinery.

Chapter 8 Electrical System

8.1 General Requirements

8.1.1 All the electrical equipment and their installations shall comply with the requirements of the RO.

8.1.2 All electrical equipment and their installations shall comply with the regulations of the International Electrotechnical Commission (hereinafter referred to IEC), Electrical Installations on Ships in the version as at the Contract Date unless the regulations specify that version of such regulations as at the keel laying date of the Vessel shall apply in relation to the relevant requirements specified therein.

8.1.3 Protective devices such as circuit breakers or fuses shall be provided at the source of power, e.g. the switchboard, to interrupt any overload current in circuit conductors before heat can damage the conductor insulation, connections or wiring-system terminals.

8.1.4 The tripping and response times of protective devices shall all be taken into consideration in order that electrical faults shall not cause interruption to other electrical circuits so far as is practicable.

8.1.5 The difference in the tripping and response characteristics of AC and DC system shall be taken into account in selecting protective systems and devices. The selection shall comply with RO and IEC requirements and be agreed by GNC.

8.1.6 All electrical apparatus shall be so constructed and installed as not to cause injury when handled or touched in the normal manner.

8.1.7 Exposed metal parts of electrical machines or equipment, which are not intended to be live but are liable under fault conditions to become live, shall be earthed.

8.1.8 A three-phase three-wire system with insulated neutral shall be adopted for the AC distribution system. Neither earthed neutral nor hull return system shall be accepted.

8.1.9 A two-wire insulated distribution system shall be used for the DC system.

8.1.10 All metal sheaths and armour for cables shall be electrically continuous and shall be earthed.

8.1.11 All electric cables and wiring external to equipment shall be at least of a flame-retardant type and shall be so installed as not to impair their original flame-retardant properties.

8.1.12 Cables and wiring serving essential or emergency power, lighting, internal communications or signals shall so far as practicable be routed clear of galleys, laundries, and other high fire risk areas.

8.1.13 Cables and wiring shall be installed and supported in such a manner to avoid chafing or other damage.

8.1.14 All components shall be marked in both English and Traditional Chinese to indicate their use. Each cable shall be clearly labelled and carry its own unique identification code. The language on all control panels shall be in both English and Traditional Chinese.

8.1.15 For each main and distribution system, whether primary or secondary, for power, heating or lighting, the insulation level to earth shall be continuously monitored and an audible and/or visual indication of abnormally low insulation values shall be provided.

8.1.16 The Contractor shall submit a layout plan showing the exact locations of electrical equipment. All electrical equipment shall be accessed easily and safely for inspection and maintenance by the submission date as stated in Annex 4 to this Part VII (viz., within two (2) months from the Contract Date).

8.1.17 Essential drawings and detailed particulars (such as the rating and capacity, type of all electrical

equipment as well as the wiring, circuit breakers, lighting and sockets, etc.) shall be submitted to the RO for approval and GNC for endorsement before installation.

8.1.18 All installations shall be provided with manuals in both English and Traditional Chinese for operation and maintenance.

8.1.19 The standard of installation shall enhance the equipment's safety features. It shall not present any hazards to the operator, e.g. all metal panels exposed to the operator shall be grounded. Warnings of any potential hazards shall be displayed in both English and Traditional Chinese, and/or with internationally recognized labels to the satisfaction of GNC.

8.1.20 Capacitors used in the system (e.g. electronic equipment, semi-conductor converter, Variable Frequency Drive ("VFD"), etc.) shall have a discharge rate in compliance with IEC and RO requirements. Protection shall be provided to avoid personnel coming into contact with the capacitors unless the voltage is at a safe level.

8.1.21 Due to the difference in response times between the DC and the AC sides, arrangements shall be made to provide sufficient current to activate the protective device and trip the circuit for the complete system (including semi-conductor converter protection, motor drive, etc.).

8.1.22 All equipment installed onboard shall comply with IEC and RO requirements and be subject to final approval from GNC.

8.1.23 If electrical fittings, not made of aluminium, are connected to aluminium, suitable means is to be taken to prevent electrolytic corrosion.

8.2 Electricity Distribution Network

8.2.1 The main electrical AC power supply shall be provided by two (2) diesel generators. Synchronising and parallel running operation is required.

8.2.2 The diesel generators shall be sized based on a 15% growth margin above the predicted maximum load condition. The Vessel's electrical load calculation shall include summer and winter, static and transient, loads on AC, DC, shore power, and ship service systems. The Vessel's electrical load calculation shall be approved by any one RO listed in Annex 9 to this Part VII and accepted by GNC.

8.2.3 The diesel generator will maintain an output voltage within ±5% over the entire load range and frequency within ±1.5 Hz.

8.2.4 The diesel generator starting circuit shall be 24V DC. Start and normal shutdown controls shall be mounted on the diesel generator along with diesel generator oil pressure and water temperature gauges; AC voltmeter and ammeter shall be directly connected to existing wiring systems with the use of a Double-Pole, Double-Throw ("DPDT") transfer switch / centre-off switch for an ammeter to read both legs (AC Volts readings).

8.2.5 The diesel generators shall be protected against short-circuits and overloads by multipole circuit breakers (overload protector).

8.2.6 The distribution of the electricity to the equipment shall be through circuit breakers fitted on an electrical distribution board.

8.2.7 Circuit breakers shall be provided for each circuit. Circuit breakers shall be of the proper voltage rating, manual reset type, designed for inverse time delay, instantaneous short circuit protection, and shall be capable of repeatedly opening the circuit in which it shall be used without damaging the circuit breaker. Circuit breakers shall indicate whether they are in the open or closed position. All circuit breakers shall be labelled to identify the circuit being protected.

8.2.8 Twenty (20) percent spare circuit breakers or three (3) spare circuit breakers, whichever is the greater, shall be provided in each distribution panel, both AC and DC. The Vessel's ENE shall

be supplied from an independent distribution panel, which shall in turn be supplied from a single breaker in the main DC panel.

8.2.9 Twenty (20) percent of spare wiring penetrations or two (2) spare wiring penetrations, whichever is the greater, shall be provided through each bulkhead except the forward collision bulkhead. Spare penetrations shall be plugged watertight with rubber plugs. The rubber plugs shall be RO approved watertight, fire resistant and gastight in way of watertight bulkhead or deck penetrations.

8.2.10 All three/single-phase loads shall be balanced on each feeder. Loads of one type such as heaters or receptacles shall not be concentrated on a single branch or leg.

8.2.11 All supply panels shall be fitted with a miniature circuit breaker of double-pole type with over-current and short circuit trips. All junction boxes shall be readily accessible. A special arrangement is required for the navigation lights supplied from this prime panel.

8.3 Switchboard

8.3.1 Provide one (1) main switchboard installed in wheelhouse, embedded installation. Bottom incoming line, front plate maintenance.

8.3.2 Switchboards for main power supplies shall be installed such that the control elements, indicating instruments, circuit breakers and fuses are readily accessible. The terminal side shall be accessible.

8.3.3 Under all normal conditions of operation, power shall be distributed from the main switchboard. The distribution system shall be designed to keep cable costs to a minimum by distributing to power panels in close proximity to the user services. Connections and components on panel-boards shall be protected from the expected environments in conformity with IEC 60529:

(a) IP 67 as a minimum, if exposed to possible short-term immersion;

(b) IP 55 as a minimum, if exposed to possible splashing water; and

(c) IP 20 as a minimum, if located in protected locations inside the Vessel.

8.3.4 Switchboards shall be permanently marked with the nominal system voltage.

8.3.5 Self-standing dead front marine type main switchboards of aluminium construction with adequate ventilation louvres shall be fitted in an accessible and well ventilated position and shall contain the following:

(a) Sector for three phase supply 380-415V AC (designed by Contractor);

(b) Sector for single phase supply 220-240V AC (designed by Contractor);

(c) Sector for 24V DC supply; and

(d) Sector for shore power supply.

The AC system is described as 380/220V AC in this Chapter.

8.3.6 Due consideration shall be given to the locations of switchboard in order to avoid any risk of damage from oil and water spray or other mechanical hazards. Adequate guardrail(s) and insulated mat(s) shall also be provided.

8.3.7 Megger test and other relevant tests shall be carried out and witnessed by GNC. The results for these tests shall form part of the Sea Trial Report that shall be submitted to GNC before Delivery Acceptance.

8.3.8 An appropriate laminated electrical diagram shall be attached on switchboard.

8.3.9 All switchboard instruments, controls, and all circuit breakers, both on external panels and inside

the switchboard, shall be provided with labels of durable flame-retardant material bearing clear and indelible indications. The appropriate ratings of fuses, the setting of adjustable protective devices and the full load current of diesel generator shall be indicated.

8.3.10 Apart from the spare feeder breakers, the switchboard shall contain but not be limited to the following:

(a) Diesel Generator Sector with the following:

(1) Circuit breaker of adequate capacity with over-current trip and short circuit trip;

(2) Voltmeter, ammeter, wattmeter and frequency meter;

(3) Indication lights for "Power Available", "Breaker Opened" and "Breaker Closed"; and

(4) All necessary fittings and any other protective devices.

(b) 220V Single Phase Sector with the following:

(1) Meters or earth lamps to indicate the state of insulation;

(2) Moulded case circuit breakers with over-current and short circuit trips for the distribution of 220V AC power supply to their components including but not limited to lighting services, fans and motors; and

(3) Any other necessary fittings and protective devices.

(c) 24V and 12V DC Feeders Sector:

(1) Transformer / rectifier of adequate capacity for converting AC power to DC power. The rectifier shall be of 1-phase full wave regulated type with voltage regulation ±5% and ripple factor 4% at 100 Hz;

(2) Magnetic automatic relay switch for activating emergency 24V DC supply in event of AC power failure;

(3) Supply source indicator lamp for transformer / rectifier;

(4) Ammeter for charging unit;

(5) Voltmeter with selector switch (charging voltage and battery voltage);

(6) Metres or earth lamps to indicate the state of insulation;

(7) Moulded case circuit breakers with over-current and short circuit trips for 24V DC bus and feeder circuits; and

(8) Any other necessary fittings and protective devices.

(d) Shore Power Connection Sector:

(1) Moulded case circuit breaker for shore connection box shall be provided on the main switchboard;

(2) The shore connection box shall be capable of receiving 380V three phase 50 Hz system and the cables between the connection box and the main switchboard shall be of sufficient capacity to supply the necessary electrical equipment;

(3) An earth terminal shall be provided for connection of the Vessel's earth to the shore earth;

(4) An instruction shall be provided at the connection box to provide full information about the system and the procedures for carrying out the connection; and

(5) The shore connection sector shall be capable of adjusting the phase sequence automatically.

8.4 DC Power Source

8.4.1 Batteries for Main Engines and Diesel Generator Starting

(a) Independent bank of 24V batteries shall be provided for starting each of the main engines and the diesel generator(s);

(b) The capacity of the batteries shall be sufficient to provide at least six (6) consecutive starts of each one of the main engines and at least three (3) consecutive starts of each one of the diesel generator from cold, without recharging;

(c) Electrical connections shall be arranged so that the batteries can be selected to start either main engine or diesel generator engine by operating a manual change-over switch in the engine room;

(d) The batteries shall be charged by engine driven alternators with backup service provided by an automatic battery charger. Interlock or protective devices shall be provided to prevent simultaneous charging from the charger and the alternator. The battery charger shall also be prevented from charging the batteries during main engine starting;

(e) Batteries are to be of maintenance-free type:

(1) 24V batteries shall be charged directly from engine driven alternators and diesel generator. There shall be one (1) battery set allocated to each engine; and

(2) Power supply batteries shall be portable, maintenance free, heavy duty, deep cycle and manufactured from environmentally friendly materials, such as lead-acid or equivalent batteries. They shall have a minimum life expectancy of five (5) years, or 200 full discharge cycles at full load and shall be rated in accordance with regulatory body requirements.

(f) Each engine driven alternator shall have its own built-in voltage regulators, automatic cut-off, and any other required protective devices; and

(g) The batteries shall be located as close as practicable to the engines in order to minimise the voltage drop. The battery bank shall be housed in a separate GRP or GRP lined storage box. Each box shall be provided with a removable cover with locking clips for ease of maintenance.

8.4.2 Batteries for Routine and Emergency Supply

(a) 24V batteries power supply shall be provided by the main switchboard via DC/DC converter for routine DC supply;

(b) Dedicated 24V batteries shall be provided for emergency DC supply;

(c) In the event of a main electrical AC power failure, 24V DC emergency batteries shall act as an uninterrupted emergency supply for all communication equipment, navigation and emergency lighting and other essential equipment (including but not limited to steering, fire monitoring and control system, vital instrumentation and related control systems) to take the Vessel to return to base;

(d) This emergency supply shall come into operation automatically in the event of a main electrical power supply failure. The capacities of these sets of batteries shall be sufficient to maintain the emergency supply in accordance with the RO requirements, but, in no case, the capability to maintain the emergency supply shall be less than for a period of six (6) hours;

(e) The emergency battery set shall be capable of maintaining its voltage throughout the discharge period within 12% above or below its normal voltage without recharging. The battery set shall automatically connect to the emergency lighting system in the event of a failure of the main electrical power supply; and

(f) The emergency battery set and its switchboard shall be located above the uppermost continuous deck and shall be readily accessible from the open deck. They shall not be located forward of the collision bulkhead. The compartment shall be well ventilated and designed to prevent the ingress of water. The batteries shall be positioned and installed in accordance with the RO requirements to the satisfaction of GNC.

8.4.3 12/24V DC services shall be supplied from the switchboard in the steering console through a 2-wire insulated system to the following items:

(a) Navigation light control panel and navigation lights;

(b) Horn;

(c) Emergency lighting;

(d) Fire detecting system;

(e) Compass light;

(f) Instrument panel in control console;

(g) CCTV;

(h) Public address system;

(i) One (1) hand-held searchlight and one (1) fixed searchlight (for aft);

(j) Siren;

(k) Watertight door indicator and alarm system;

(l) Unmanned duty alarm system; and

(m) Any other navigational and electronic equipment (if applicable).

8.4.4 The batteries as required in Paragraphs 8.4.1 and 8.4.2 shall be subjected to continuous trickle charge under normal operation of the Vessel through an automatic battery charger. In the event the batteries are fully discharged, the charger shall be able to perform a quick charge function.

8.4.5 Apart from the charger, a provision shall also be made to allow the batteries to be charged by an engine driven alternator. The battery chargers shall provide automatic control between float and boost charges. Each charger shall also be provided with a voltmeter, voltage regulator, selector switch, blocking rectifier, and the required devices for protecting the chargers against short circuit, reverse connection, excessive temperature and overloading. The capacity of each battery charger shall be sufficient for charging one (1) set of completely discharged starting batteries to fully charged condition within ten (10) hours.

8.4.6 Battery charger installations shall meet all regulatory body requirements including:

(a) One (1) set of charging and discharging board with one (1) charger for routine and emergency batteries located in the engine room. The charging method shall be float-charging type and boosting charge type with manual voltage adjuster;

(b) The charger is equipped with a rectifying device. When the main power supply is normal, the rectifying device provides 24V DC power. When the main power fails, it shall automatically switch to battery for power supply. The character of the battery charger shall be 220V AC with 50Hz input while the maximum output voltage shall be approximately 28V DC;

(c) The chargers shall be sized such that a completely discharged battery bank can be recharged to 80% capacity within eight (8) hours (100% at ten (10) hours). At the end of the charge, the charge shall be tapered to a trickle value;

(d) The chargers shall be fitted with a pilot lamp, a charging adjustment, a voltmeter and an ammeter indicating charging current;

(e) Discharge protection shall be provided to prevent a failed charger component from discharging the battery bank;

(f) Battery charging facilities will be available via the main propulsion engines and the 220V AC diesel generator. Battery chargers shall not be mounted directly over batteries;

(g) Battery selector/isolator switches shall be provided between battery chargers and the battery banks they serve; and

(h) Provisions shall be made to allow either main engine to be started by the other engine's starting batteries.

8.4.7 An instruction plate with a schematic wiring diagram illustrating the operating procedures and precautions for the selection of battery banks and charging of batteries shall be provided in the vicinity of the charger, battery selection switchboard and charging distribution board. All charging control shall be conducted from the wheelhouse.

8.4.8 Batteries shall not be installed directly above or below a fuel tank or fuel filter.

8.4.9 Any metallic component of the fuel system within 300 mm above the battery top, as installed, shall be electrically insulated.

8.4.10 Battery cable terminals shall not depend on spring tension for mechanical connection to them.

8.4.11 A battery-disconnect switch shall be installed in the positive conductor from the battery, or group of batteries. It shall be connected to the supply system voltage in a readily accessible location and shall be as close as practicable to the battery or group of batteries, except the circuits for engine starting, navigation lighting and electronic devices with protected memory and protective devices; such as bilge-pumps and alarms, if individually protected by a circuit breaker or fuse as close as practical to the battery terminal.

8.4.12 Local information plates showing the voltage, ampere-hour rating, group number and application shall be provided for each battery set.

8.5 Shore Power Supply and Connection

8.5.1 The required AC loading and charging power shall be proposed by the Contractor and agreed by GNC at the kick-off meeting.

8.5.2 An isolation transformer shall be fitted. A moulded case circuit breaker for the shore connection box shall be provided on the main switchboard.

8.5.3 The shore connection box shall be capable of receiving 380-415V three phase 50Hz system, and the cables between the connection box and the switchboard shall be of sufficient capacity to supply the necessary electrical equipment.

8.5.4 The shore power shall be arranged to supply the loading of the Vessel whilst the Vessel is berthed alongside and the corresponding distribution panel is to be provided. The arrangement shall be such as to avoid the necessity of starting up the diesel generator whilst the Vessel is alongside and connected to the shore power. The capacity of the power source and the equipment supplied shall be discussed and agreed by GNC at the kick-off meeting.

8.5.5 An earthing terminal shall be provided for connecting the Vessel's earthing to the shore earthing.

8.5.6 An instruction shall be provided at the connection box to provide full system information and the procedures for the connection.

8.5.7 The shore power system shall be interlocked to prevent the Vessel's diesel generators from providing power to the shore at the same time. Indicating lights for "shore power available", "shore power breaker on" and "shore power breaker closed" shall be fitted and shall be with phase sequence automatic adjustment device.

8.5.8 The Contractor shall provide a 1:1 isolation transformer for the shore power supply to the AC loading. The core of the isolation transformer shall be completely insulated from the case. The isolation transformer enclosure shall be drip-proof. The transformer shall be rated for continuous operation at the full capacity of the shore power connection.

8.5.9 The watertight connection box shall be designed with a quick release device.

8.5.10 Not less than thirty (30) meters of shore connection power cable of adequate rating with quick release watertight plug shall be provided.

The shore connection power cable shall be fitted with compatible connections to connect to existing facilities at the Government Dockyard as identified by GNC and HKPF operational bases. Suitable stowage onboard shall be provided for the cable.

8.6 AC Distribution Boards and Circuit Breakers

8.6.1 Electrical distribution shall be installed throughout the Vessel for AC electrical distribution. Distribution panels shall be of a drip-proof steel construction with hinged doors.

8.6.2 Moulded case circuit breakers are to be fitted as far as possible on all sub-circuits. Wherever this is not possible, fuses may be used subject to GNC acceptance. Wherever the sub-circuit is three phase or the current is above 60A, the moulded case circuit breakers shall be fitted with thermal and magnetic tripping devices.

8.6.3 All circuit breakers shall have time delay thermal overload tripping devices and instantaneous short circuit current tripping devices. The overload tripping devices shall be set at 110% of the maximum circuit load current. The cable rating shall be in excess of the circuit breaker overload tripping current.

8.6.4 Circuit breakers shall act as protective devices only and shall not be used for switching purposes. An individual on/off switch shall be installed for each electrical fitting.

8.6.5 All distribution boards and circuit breakers are to be clearly labelled with the name of each circuit. Labels are to be in both English and Traditional Chinese.

8.7 Motor and Control Gear

8.7.1 Where a starter is situated remotely from the motor, stop and start buttons shall be provided near the motor for local operation. All electric motors for essential services shall have separate start and stop push buttons plus running indication lights (with dimmer control) inside the wheelhouse console.

8.7.2 Soft-starting shall always be taken into consideration to avoid excessive system voltage drop.

8.7.3 Motors installed in the engine room and other enclosed spaces shall be of semi-enclosed drip-proof type. Motors installed in locations exposed to weather or moisture shall be of waterproof construction. Insulation of motors shall not be less than Class B standard under IEC Regulations for the electrical and electronic equipment.

8.7.4 A circuit diagram shall be placed in the local control box of each electrical installation.

8.7.5 Individual Starter:

(a) Starters, which are not contained in the group starter panels, are to be mounted in the drip-proof metal cabinet; and

(b) The cabinet shall be bulkhead mounting type near the respective motor.

8.8 Level Alarm and Indicator Panel

8.8.1 The Contractor shall provide a level alarm and indicator panel in the wheelhouse with 24V DC power supply from general batteries.

8.8.2 All bilge water high level alarm signals shall be connected to the unmanned duty alarm system.

8.9 Cable, Wiring and Fuse

8.9.1 Cables, which may be exposed to physical damage, shall be protected by sheaths, conduits or other equivalent means. Cables passing through bulkheads or structural members shall be protected against damage to insulation by chafing. When cables pass through bulkheads and decks with certain fire protection requirements, integrity shall not be weakened.

8.9.2 Where cables are protected by pipe conduits, the space factors of the pipe conduit shall conform to IEC regulations in order to prevent bunching of wires and to minimize earth faults.

8.9.3 Cables shall have minimum dimensions in accordance with IEC regulations or other equivalent international standard acceptable to GNC, or the conductor manufacturer's rated current carrying capacity, based on the load to be supplied and allowable voltage drop for the load to be carried.

8.9.4 Cables shall be flame-retardant, marine type, low smoke, zero halogen according to IEC 60332-3. Their selection and method of application shall comply with IEC 60092-352 and the RO requirements.

8.9.5 Cabling for emergency systems shall also comply with the higher fire survival rate stipulated in IEC 60331 and the RO requirements.

8.9.6 Cables in voltage-critical circuits, such as starter motor circuits and navigation light circuits, whose output may vary with system voltage, shall be sized in compliance with the component manufacturer's requirements.

8.9.7 The metallic sheathing, armour or braid of cable shall be properly earthed at both ends. All bare terminals shall be properly insulated using approved cable insulators.

8.9.8 Cables that are not sheathed shall be supported throughout their length in conduits, cable trunking or trays, or by individual supports at maximum intervals of 300 mm. Cushioning/protection on the overhead cable trunk for preventing crew head injuries shall be provided in the engine room.

8.9.9 Sheathed cables and battery cables to the battery disconnect switch shall be supported at maximum intervals of 300 mm, with the first support not more than one (1) m from the terminal. Other sheathed conductors shall be supported at maximum intervals of 450 mm.

8.9.10 Cabling shall be run along perforated metal trays and shall be secured in such positions as to allow easy maintenance.

8.9.11 Cabling inside accommodation areas shall be run behind linings, but shall not be embedded inside the insulation, which shall have removable panels for inspection and maintenance.

8.9.12 RO approved watertight, fire resistant and gas tight cable sealing systems shall be provided at watertight bulkhead or deck penetrations. The penetration shall be located as high as practicable and well clear from the ship side. The penetration detail shall be designed, tested and installed to the satisfaction of GNC and the HKPF.

8.9.13 Separation is to be provided on cable runs for power cables, instrument cables, control cables and computer network cables in accordance with manufacturer's recommendations and in line with the requirements of IEC 60533 Annex 'C'.

8.9.14 Each electrical cable, that is part of the electrical system, shall have means to identify its function in the system.

8.9.15 Cables and the wiring terminals of different AC and DC power supply voltages in the junction box, the fuse box and the equipment terminal box shall be laid separately and shall have a distinctive code and labelling system for easy identification.

8.9.16 Tally plates showing the cable size shall be provided for each of the main power cables.

8.10 Lighting Fixtures

8.10.1 General lighting shall be provided for all compartments and shall be arranged to give sufficient illumination to all working areas for normal operation. All lighting shall be equipped with LED bulbs including the navigation lights.

8.10.2 The general lighting system described herein shall consist of fixtures permanently installed as necessary to provide the levels of illumination required to an approved standard. The system shall include fixtures, switches, panels, boxes, and cabling for the distribution system supplying the lighting fixtures. Fixtures shall be accessible for maintenance and cleaning.

8.10.3 General lighting shall have individual or group switches to conserve power.

8.10.4 All lighting in the wheelhouse control panel shall be fitted with a dimmer control for night time operation. It shall also be possible to set internal lights within the wheelhouse to red light for night operations.

8.10.5 Emergency exit routes shall be identified and illuminated as required by the RO requirements. 24V DC emergency lighting shall be provided for emergency embarkation stations, open decks, all compartments and internal passageways to clearly indicate the exits so that occupants shall be able to find their way out of the accommodation, as per the RO requirements. Such lighting shall be connected to the emergency lighting switchboard and be automatically illuminated when power to the normal lighting is lost.

8.10.6 Suitable lighting shall be provided in all working areas such as the food preparation area, tea table and other areas determined by GNC.

8.10.7 Controls shall be provided within each compartment for illumination therein. Each light shall be manually controlled by a switch located at the primary entrance to that compartment and switches for this purpose shall be installed near the access and located so as not to be obscured when the door is open. A separate switch shall be provided in each compartment to control each group of lights. Switches shall break both sides of the circuit (double pole). Fixtures shall be installed so that illumination will not be obstructed by fixed pipes, ducts, bins and berths.

8.10.8 Fixtures shall be mounted so as not to vibrate in any operating condition and so that the Vessel vibration will not harm the fixtures. Fixtures shall be selected and mounted to maintain the maximum possible headroom.

8.10.9 All sockets, terminal blocks, switches and receptacle interiors shall be made of non-flammable phenolic material.

8.11 Navigational Light

8.11.1 All navigational and signal lights to be provided shall be in compliance with the International Regulations for Preventing Collisions at Sea (1972 as amended) (“COLREGs”) and all applicable (“IMO”) Resolutions. Type approval certificates in respect of each model of the navigational and signal lights issued by any one RO listed in Annex 9 to this Part VII shall be provided before the Delivery Acceptance at the latest.

8.11.2 The lighting shall be controlled from a control and alarm signal panel in the wheelhouse. Each navigation light circuit shall be provided with a switch, protection fuse, indicating lamp and

alarm. A dimmer for the panel indication lights, buzzer stop and lamp test buttons shall be fitted. The navigation light control panel alarm shall have communication interface to the Navigation Data Recorder ("NDR").

8.11.3 Navigation light circuits shall be independent of any other circuit. There shall be two (2) essentially separate power supply systems to the distribution board; namely, one (1) from the main AC power source and one (1) from the emergency DC power source.

8.11.4 The following navigational and signal lights with double-pole circuit breakers and shapes shall be provided:

(a) Port-side light (double tier, easy to access together with the corresponding controls);

(b) Starboard-side light (double tier, easy to access together with the corresponding controls);

(c) Stern light (double tier, easy to access together with the corresponding controls);

(d) Masthead light (double tier, easy to access together with the corresponding controls);

(e) Anchor light;

(f) Combined Not Under Command ("NUC") and diving lights;

(g) Two (2) masthead white lights in vertical line (forward arc) and a towing light above the stern light as per COLREGs 1972 to indicate a tow less than 200m;

(h) Horn;

(i) One (1) all-round flashing blue light on the top of mast without restriction, indicating the Vessel is a police vessel;

(j) Black ball (three (3) numbers);

(k) Black diamond;

(l) Whistle;

(m) Bell; and

(n) Any other navigation lights as required.

8.11.5 Three (3) sets of spare bulbs shall be provided for the navigational and signal lights.

8.12 Searchlight

8.12.1 Two (2) proprietary make 220V AC LED remote controlled power-operated searchlight shall be installed on top of the wheelhouse, to be integrated into the radar and directly using inputs from the radar to manoeuvre the searchlight.

8.12.2 Sufficient proprietary make 220V AC LED manually operated searchlights to cover sea areas at the forward, side and aft of the Vessel.

8.12.3 Searchlight controllers are to be provided at the launch commander's console starboard side and lookout port side console.

8.12.4 High quality covers shall be provided for each searchlight. Suitable fastenings shall be fitted to searchlights/ the wheelhouse top to facilitate fitting of searchlight covers.

8.12.5 In addition to the searchlights stated in Paragraph 8.12.1 of this Part VII, two (2) 24V DC LED portable searchlight (with luminosity equivalent to not less than 150W conventional type) with a thirty (30) metres waterproof cable reel and plug shall be provided. Portable searchlights shall be stored in the wheelhouse. A trigger switch shall be integrated into the grip for Morse code operating.

8.13 Floodlight

8.13.1 AC LED floodlights shall be fitted, with remote operation from the wheelhouse and the operational console shall be confirmed with GNC. All maker's standard fittings and accessories shall be provided.

8.13.2 The floodlights shall be fixed to the wheelhouse roof in order to provide full illumination of the main deck and surrounding water.

8.13.3 The arrangement shall be designed and installed to the satisfaction of GNC and the HKPF.

8.14 Power Receptacles / Sockets

8.14.1 Receptacles/sockets installed in locations likely to be subjected to rain, spray or splashing shall have a minimum protection of IP 56, in accordance with IEC60529 when not in use, e.g. protected by a cover with an effective weatherproof seal. Protection from wave slamming in outdoor open locations shall be provided.

8.14.2 A system of 220V AC 13A and 24V DC 5A socket outlets shall be provided in the engine rooms.

8.14.3 Sufficient socket outlets for 220V AC and for 24V DC shall be provided in the wheelhouse to the satisfaction of GNC and the HKPF.

8.14.4 Socket outlets for 220V AC shall be provided throughout the Vessel. The Contractor shall design and install the socket outlets as required and to the satisfaction of GNC and the HKPF.

8.14.5 Each socket outlet shall be integrated with an 'On/Off' switch to facilitate local switching of the electrical equipment. The 220V AC socket outlets shall be double pole protected and supplied with 13A 3-square-pin fused plugs. The 24V DC socket outlets shall be supplied with fused plugs.

8.14.6 Sockets for different voltage systems shall be clearly labelled and with different pin sizes so that one system cannot plug into the other.

8.14.7 Power sockets on the weather deck, in the engine room and other damp locations shall be watertight and be provided with watertight covers and switches. All power plugs provided for the portable equipment intended to be used in these areas shall also be of weatherproof marine type.

8.14.8 The following areas are deemed to be hazardous and as such shall not have electrical cables led through unless specifically required for services within the space:

(a) Pyrotechnics store;

(b) Arms and ammunition locker; and

(c) Any spaces containing flammable/ dangerous goods at the discretion of GNC.

8.14.9 Only flameproof or intrinsically safe electrical equipment shall be used in these areas.

8.14.10 No electrical wiring shall be fixed directly to the outside of the bulkheads adjacent to these areas/ compartments/ spaces.

8.14.11 Any cabling which is required within spaces shall be screened and earthed in accordance with the RO requirements. Where access to cabling is required, dust tight conduit boxes shall be provided.

8.14.12 Starters, socket outlets and light switches shall not be installed within hazardous spaces.

8.15 Monitoring and Control System ("MCS")

8.15.1 Monitoring and Control System ("MCS") shall be provided on board. The information from this MCS system shall be capable of being shown in Integrated Navigation System ("INS").

8.15.2 The system shall be capable to monitor and control the following information and function:

(a) All the main engine alarms and running parameters;

(b) All the diesel generator alarms and running parameters;

(c) All the water-jet alarms and running parameters;

(d) All the gearbox alarms and running parameters;

(e) AC electrical system;

(f) Fire detection system and alarm;

(g) FM-200 system and alarm;

(h) Fans (under main deck) control;

(i) General engineering system including fire pump control, bilge alarm and pump control, and tank level alarm and gauges (freshwater tank, fuel oil tank, black water tank, etc.);

(j) Sewage system;

(k) Marine growth protection system;

(l) Air conditioning system;

(m) Watertight door and hatch open/close monitoring and alarm system;

(n) Other related alarm signals and any other signals (if applicable); and

(o) Any other alarm controls, gauges or monitors as required by GNC.

8.15.3 The system shall comprise a central processing unit, signal acquisition module, signal output module, Human-Machine-Interface workstation, extended alarm board and other hardware as necessary. The system shall adopt distributed architecture. In order to meet the requirements for system reliability and redundancy, the CPU redundancy configuration, acquisition module field bus and power redundancy configuration shall be adopted. In the event of the main CPU fails, it shall automatically switch to the redundant processor.

8.15.4 The system hardware shall support the hot swap function and replace the hardware without interrupting the system.

8.15.5 Input channels shall be continuously monitored and when any input of them deviates from the pre-set value, an alarm shall be activated with audible and visual signals generated by the annunciator unit.

8.15.6 The alarm system shall be arranged in separate groups for main engines and its auxiliary machinery.

8.15.7 The instrument gauges and alarms shall be arranged in good order for the safety of operation and ease of maintenance.

8.15.8 An Uninterruptible Power Supply ("UPS") shall be provided for the Monitoring and Control System.

8.15.9 The monitoring, control and operation of the engineering systems shall be provided in the wheelhouse engine remote control console.

8.15.10 The MCS system shall be able to search for the alarm records in the format of yyyy/M/d-H:mm:ss, and save the alarm records for at least six (6) months. The alarm records can be easy copied via a USB flash drive.

8.15.11 System and implementation details of the MCS shall be discussed in the kick-off meeting.

8.15.12 The system shall have one (1) 19" or larger multifunction display, acceptable to the HKPF, in the wheelhouse remote engine control console as detailed in Paragraph 9.3.3(g) of this Part VII. The multifunction display shall be dedicated for operating and primarily displaying the MCS and shall also be able to switch between MCS and CCTV system. The display is to be fitted within a console which is to be angled such that the view on the display is not compromised.

Chapter 9 Operational Systems

9.1 Overview of Requirements

9.1.1 The Contractor shall supply, deliver, install, commission, conduct trial tests and provide 12-month Warranty Services from the date of the Acceptance Certificate, provision of operational and maintenance service manual, and training for all the on-board operational systems (hereafter collectively referred to as "Operational Systems") to meet the purposes of the Vessel outlined in Paragraph 1.2 of this Part VII. "Operational Systems" include the Integrated Navigation System ("INS") specified in Paragraph 9.3 of this Part VII, and all Electronic Navigation Equipment ("ENE") listed in Paragraph 9.4 of this Part VII. "Operational System" (singular) means any one of these items. The MRCS radios, Marine Situational Awareness System ("MARSAS"), and other Police Special IT Equipment will be supplied and installed by the HKPF or HKPF's other contractors, whereas the Contractor shall supply the infrastructure specified in Paragraph 9.21 of this Part VII for these items. All other systems/equipment listed in this Chapter 9 of Part VII shall be supplied by the Contractor.

9.1.2 The Tenderer shall submit its Technical Proposal for the Operational Systems in Schedules 6 and 7 of Part V.

9.1.3 As the design and construction of the Vessels will take a number of years from proposal until delivery of the Vessels, particularly the later models in the Class, the proposal shall contain a plan for ensuring the future proofing of the technology.

9.2 General Requirements

9.2.1 All Operational Systems shall be marine type and comply with the relevant regulations of SOLAS, IEC and the International Telecommunications Union recommendations in the International Radio Regulations ("ITU-R"), unless explicitly stated otherwise. They shall comply with all relevant IMO recommendations on performance standards and operational features. All radio communications equipment, including radars and radios, shall also comply with the requirements of the Office of the Communications Authority of Hong Kong ("OFCA").

9.2.2 The Contractor shall observe and adopt the International Commission on Non-Ionizing Radiation Protection ("ICNIRP") Guidelines and the Code of Practice issued by OFCA of the HKSAR on the limits of exposure to radio frequency electromagnetic fields in the frequency range from 100 kHz to 300 GHz for the protection of operators, workers and the public against Non-Ionizing Radiation ("NIR") hazards so as to provide a safe and healthy working or living environment under all normal conditions. In case of multiple simultaneous exposures, the combined effect of such exposure shall also be assessed in accordance with the ICNIRP Guidelines.

9.2.3 The Contractor shall warrant that all Operational Systems and materials used, irrespective of whether they are in operation or not, shall comply with the health and safety standards adopted by the World Health Organization in particular in relation to all harmful radiation. The Contractor shall also disclose in writing the existence of any radio frequency radiation hazard emitted from the Operational Systems equipment, which is harmful to human beings under normal operating conditions, in accordance with the safety standards adopted by ICNIRP, American National Standards Institution ("ANSI"), or other equivalent national or international standards.

9.2.4 All Operational Systems shall be suitable for round-the-clock operations with equipment displays that shall have adjustable brightness levels and be suitable for viewing under different lighting conditions, including direct sunlight, day, dusk, dawn and at night without causing eye-strain, glare and/or discomfort. Equipment control keys and buttons shall be suitably backlit

with adjustable brightness levels to aid operation in the dark. All Operational Systems shall perform effectively even under the most adverse weather conditions.

9.2.5 The main components of the Operational Systems shall be installed inside the wheelhouse. All designs and installation/mounting proposals shall be approved by GNC and HKPF prior to the commencement of any such work.

9.2.6 In addition to the submission of layout plans in accordance to Annex 3 to this Part VII to GNC and HKPF, to facilitate the optimal design, user-friendliness, effectiveness and easy accessibility for inspection and maintenance of all on-board systems, following Contract award and during the design phase, the Contractor shall construct a full-size wheelhouse mock-up for comment and approval by GNC and HKPF. The mock-up shall show the positions and arrangement of the actual Operational Systems and other equipment before construction and installation commences. During the mock-up meeting, the Contractor shall provide drawings that show the installation locations of all the other Operational Systems that are installed on the mast, roof top, inside the consoles and other locations, before construction and installation.

9.2.7 In addition to all the Operational Systems, (viz INS listed in Paragraph 9.3 of this Part VII, all other ENE listed in Paragraph 9.4 of this Part VII and all other communication systems) that the Contractor is required to provide for each Vessel under Chapter 9 of this Part VII, the Contractor shall also provide two (2) complete sets of these Operational Systems (one (1) set equal to the same quantities as installed on one (1) Vessel) as Contract Spare Parts in Schedule 1. In the event that any equipment is substituted during the Contract Period, the Contractor shall supply two (2) sets of the substitution equipment as spare parts.

9.2.8 All the equipment of the Operational Systems of the Vessel and its spare parts shall be serviceable and have technical support and maintenance services available locally in HKSAR upon the completion of the Warranty Period.

9.2.9 The power supply for all the equipment of the Operational Systems specified in Chapter 9 of this Part VII shall be from the Vessel's UPS with backup battery support for at least thirty (30) minutes.

9.2.10 The Contractor shall submit design description, schematic diagrams, hardware and software specifications, installation drawings and integration design including but not limited to the Operational Systems specified in this Chapter 9 of Part VII to HKPF for approval within the time specified by the HKPF and prior to the commencement of any such work during design stage.

9.2.11 Upon receipt of a request from the HKPF, the Contractor shall alter or adjust or modify any of the deliverables as specified in Paragraph 9.2.10 of this Part VII to the satisfaction of the HKPF without causing any delay to the Implementation Plan or such other time requirements set out in the Contract, at no additional cost to the Government.

9.2.12 Design Standards

(a) Environmental Conditions:

(1) All Operational Systems shall be capable of operating continuously to the specifications contained in this Part VII, throughout the normal life span of such systems, in the HKSAR climate and environment. The following parameters shall apply unless otherwise stated:

(i) Ambient temperatures between 0 °C and 40 °C and between -5 °C and +50 °C if the equipment (including antennae) is exposed to the open air;

(ii) Relative humidity up to 95%, non-condensing;

(iii) Salt and chemical corrosion as found in a tropical coastal atmosphere; and

(iv) Materials that promote mould growth shall not be used.

(2) The Operational Systems shall be rugged and capable of withstanding the knocks and

jolts likely to occur during repair work or in operating environment as specified in Paragraph 2.7.5 in the Part VII.

(b) Power Supplies:

(1) The power supply for all Operational Systems shall be protected by appropriate circuit breakers;

(2) All Operational Systems shall be capable of working normally when powered by the Vessel's battery-backed DC and AC supply systems. DC/DC converters and AC/DC converters, etc. shall be provided if the equipment cannot operate at this voltage;

(3) Six (6) spare power supply connections shall be required with a negative earth and be connected to a designated 12/24V DC (nominal) battery-backed power supply. The battery shall be charged up when an engine generator is working;

(4) There is a possibility of DC leakage through the negative grounding to the DC battery power bank on the supplied equipment if it is not connected properly. The Contractor shall take precautions to prevent this type of leakage, e.g. by using an isolation converter;

(5) The power supply of all Operational Systems shall be compatible with the Vessel's electrical system. If necessary, a voltage stabiliser or regulator shall be provided and installed to maintain the Operational Systems in proper working condition when connected to the unsteady DC voltage from the generator;

(6) Adequate provision shall be made to protect the Operational Systems from the adverse effects of excessive voltage, current spikes and surges;

(7) Suitable devices shall be incorporated for protecting the Operational Systems and accessories against damage due to lightning and the unregulated DC power supply onboard; and

(8) Selected Operational Systems equipment shall be connected to individual external switches for controlling the power on or off status of the individual Operational Systems equipment and the illumined device on the control panel. The location of external switches shall be easily accessible. The actual devices to be connected to the external switches shall be subject to the approval of the HKPF.

(c) Safety:

(1) All Operational Systems supplied shall be of a safe design and shall be installed in a safe manner as approved by GNC and the HKPF. The standard of installation shall enhance the equipment's safety features and not present any hazard to users;

(2) All Operational Systems shall be properly grounded to an electrical earth. The installation shall not present any hazard to the user in any way, e.g. grounding of all metal parts exposed to the user;

(3) Electrical contacts and Printed Circuit Boards ("PCB") shall also be protected in an appropriate manner that does not impair their electrical characteristics;

(4) Lightning protection devices (e.g. lightning surge arrestors/dissipaters as specified in Paragraph 4.16 of this Part VII) are required, particularly for antennae installed outside the protection zone of the Vessel's own lightning protection device;

(5) The lightning surge arrestors/dissipaters of each feeder cable shall be grouped and concentrated in a "lightning arrestor panel" for ease of maintenance; and

(6) Warnings of any potential hazard associated with the Operational Systems shall be displayed in Traditional Chinese characters, English and universally recognised labels in easily visible and prominent positions.

(d) Design Practice:

(1) All systems shall be designed for prolonged, continuous and reliable operation, i.e. twenty-four (24) hours per day and 365 days per year;

(2) The normal serviceable life of the Operational Systems shall be a minimum of five (5) years operation on board the Vessel. Evidence of a service life exceeding five (5) years will be evaluated accordingly as well as that of future proofing the expected upgrade in technology;

(3) The design, construction and installation of the Operational Systems shall be to a standard of engineering acceptable to COMMS;

(4) The display digits in the Operational Systems control panels and displays shall be easily legible;

(5) To facilitate night time operations, Operational Systems control panels shall have a dimming function enabling the light emitted from the Operational Systems display to be regulated progressively;

(6) All units, sub-assemblies, components and adjustable controls of the same type shall be both mechanically and electrically interchangeable without the need for changing connections or wiring. They shall be readily accessible for maintenance purposes;

(7) Correct impedance matching shall be maintained at all interfaces between any items of any equipment (e.g. audio at 600 ohms or RF at 50 ohms);

(8) Adequate testing points and other testing facilities, e.g. extension boards, testing probes, shall be provided to permit ease of maintenance; and

(9) Any equipment installed in an external position and exposed to the maritime environment shall have the level of IP protection appropriate to its function and position.

9.2.13 Appearance and Protective Finish:

(a) Metal surfaces shall be either corrosion resistant or protected against corrosion for a period of at least three (3) years by high grade enamel painting, plating, galvanising, anodising, or any other suitable surface treatment; and

(b) Any such protective layer shall be smooth, continuous, and free from blemishes and scratches.

9.2.14 Installation Standards:

(a) All Operational Systems, except portable systems, shall be fixed firmly in place. Fastenings and supports shall support their loads with a safety factor of at least three (3);

(b) The Operational Systems shall be supplied with all auxiliary items required including but not limited to the followings, for normal operations:

(1) Connectors;

(2) Circuit breakers;

(3) Lightning arrestors/dissipaters;

(4) Power sockets;

(5) Plugs; and

(6) Cables.

(c) RF connectors (of suitable impedance) shall be provided and used for connecting the RF cables, antennae and radio equipment;

(d) All exposed connectors shall be protected by weatherproof material (e.g. 3M self-adhesive tape or equivalent) to prevent water ingress;

(e) Special attention shall be paid to the compass safe distance [Marine Guidance Note MGN 57 (M+F), Maritime and Coastguard Agency, and IMO Resolution A.694 (17)] of the ENE and the radiation hazard zone of the radar scanner in the Vessel's design. Positioning of the Operational Systems and the associated accessories shall be planned carefully in respect of their relative distances to eliminate any chance of radio interference that might occur whilst in service;

(f) Installation shall be to the highest standard to ensure:

(1) The relevant Merchant Shipping Notices ("'M' Notices") published by the Department of Transport (London) in respect of setting and installing the compass, VHF radio and sounding devices are observed in the version as at the Contract Date unless the rules and regulations of RO specify that version of such rules and regulations as at the keel laying date of the Vessel shall apply in relation to the relevant requirements specified therein;

(2) Satisfactory performance of the Operational Systems;

(3) Protection from mechanical and water damage;

(4) Ease of accessibility for maintenance and repair;

(5) Manufacturers' recommendations are followed strictly;

(6) Precautions and measures shall be taken and adopted in the installation of the Operational Systems to ensure that the g-forces and vibration encountered by the Vessel travelling at high speed in rough seas will not affect the operation of any of the Operational Systems; and

(7) The installation in the environment shall withstand the conditions stated in Paragraph 9.2.12(a)(1) of this Part VII.

(g) Adequate measures to prevent interference between the electronic equipment shall also be provided for receiving apparatus and other electronic equipment, which may be affected by frequency induced voltage, shall be earthed, screened and protected according to the rules, regulations and recommended practices regarding screening of electric wiring.

9.2.15 Cable Laying

(a) General Cable Requirements:

(1) All cables shall be rated and sized properly;

(2) The signal cables shall be screened properly to reduce the cross-talk level as necessary; and

(3) All feeder cables shall be of one length, without joints, from antennae to the equipment and from equipment to equipment, unless such joints are necessary under the specific installation conditions encountered or for ease of maintenance. All joints if provided shall be reliable and durable.

(b) Cables shall be laid in concealed cable trunks and trays inside consoles or other compartments or under the decks unless approved otherwise by GNC and HKPF, with due consideration given to the ease of maintenance of the Vessel as a whole. Solutions adopted shall not pose occupational safety and health risks such as trip, snag or impact hazards to the Vessel's crew during operations.

(c) Watertight rubber grommets, insulated bushes or cable glands shall be used to protect the cables when passing through the metal covers of distribution boards, boxes, or any other metalwork or exposed structures.

(d) The Contractor shall be responsible for the supply, installation and inter-connection of all cables and all related installation materials within the system as well as the final connection between the power supply and any of the Operational Systems;

(e) Wires and cables shall be as short as practicable with sufficient slack:

(1) To enable parts to be removed and replaced during servicing without disconnecting other parts;

(2) To facilitate field repairs of broken or cut wires; and

(3) To facilitate movement of the Equipment for maintenance purposes.

(f) All wiring terminations shall be finished in a neat and approved manner and shall be identified separately by a unique identification wiring code number.

9.2.16 Labelling and Marking:

(a) All Operational Systems supplied shall carry the name, trademark or other means of identifying the manufacturer;

(b) Major Operational System units and sub-units shall carry a permanent label with serial numbers for identification purposes;

(c) All panels, sub-assemblies of the Operational Systems and internal and external cables shall be marked or labelled clearly with their own unique identification codes, in English, in a permanent manner so as to identify each individual function. Such labels shall be recorded and organised properly in a document and handed over to COMMS through GNC prior to Delivery Acceptance;

(d) All switches, connectors, jacks or receptacles shall be marked clearly, logically and permanently during installation. All wires and cables shall be identified at every termination and connection point with permanent type markers; and

(e) The DC circuit breakers controlling the Equipment shall be labelled clearly.

9.2.17 Acceptance Test

(a) The acceptance tests for each Operational System shall consist of three (3) parts: bench tests, Factory Acceptance Test ("FAT") and on-site commissioning tests as follows:

(1) Upon the request of the Government, bench tests shall be performed on the Operational Systems to demonstrate their technical compliance with the published specifications. The bench test, if not carried out in the HKSAR in the presence of COMMS representatives, may be accepted in the form of a test report from the original equipment manufacturer certifying that the tests have been conducted and passed satisfactorily before the equipment left the factory;

(2) The Contractor shall carry out the FAT in the presence of GNC and HKPF representatives to demonstrate that each Operational System item individually and that all Operational Systems as a whole were installed properly and function as intended. If the Vessel is not constructed in the HKSAR, the Equipment FAT shall be conducted at the manufacturer's shipyard before the shipping of the Vessel to the HKSAR in accordance with the procedures specified at Paragraphs 1.8.1(d) and 1.8.1(f) of this Part VII.

(3) The on-site commissioning tests shall be carried out by the Contractor in the HKSAR, as part of Stage 2 and 3 of the Technical Acceptance, in the presence of GNC and HKPF representatives after completion of installation of all Operational Systems. This includes any additional Operational Systems provided to the Contractor by the HKPF for installation as specified in Paragraph 9.21 of this Part VII; and

(4) The on-site commissioning tests shall include an inventory check, an NIR hazard test,

an inspection of the installation of the Operational Systems and thorough technical, functional and integration tests of individual Operational Systems and all Operational Systems together as a whole and a sea trial to verify that the Operational Systems have been commissioned properly and are ready to be put into service on the Vessel.

(b) The Contractor shall ensure and demonstrate, as part of the on-site commissioning tests, that the electric and magnetic fields as well as the power density radiated from all installed Operational Systems do not expose occupational personnel and members of the general public to radiation in excess of the limits contained in the ICNIRP Guidelines specified in Paragraph 9.2.2 of this Part VII. Prior to the issuance of the Acceptance Certificate, the Contractor shall provide a full written report stating that the installation of the ENE complies with the stated NIR safety standard; and

(c) At least two (2) months prior to the bench tests, the FAT and the on-site commissioning tests, the Contractor shall submit details of the schedules and test procedures for all Operational Systems for approval by the HKPF. When all of the test procedures have been agreed by the HKPF, they shall be followed during the relevant tests. Any delay in the submission of these procedures may lead to a corresponding delay in their agreement and, hence, in the commissioning of the Equipment for which the Contractor will assume the financial liability.

9.2.18 Documentation:

(a) At least six (6) weeks prior to Delivery Acceptance, for each individual item of equipment of the Operational System, the Contractor shall supply to COMMS, through GNC, three (3) paper copies of the operational manuals and maintenance manuals in English (at least one (1) original) and two (2) soft copies in USB or equivalent device. For the avoidance of doubt, these three (3) sets of operation and maintenance manuals are in addition to those required as part of the documentation for each Vessel as specified in Paragraph 10.2.6(h) of this Part VII. The manuals shall provide the information listed below:

(1) Description of the principle of operation;

(2) Details of installation and setting up procedures;

(3) Maintenance instructions including mechanical assembling and disassembling procedures;

(4) Schematic diagrams and block diagrams with their respective descriptions; and

(5) Fault finding and calibration procedures.

(b) Drawings showing the proposed design of conduit/trunking routes for the equipment installed on board, including future maintenance considerations shall be submitted to GNC and COMMS for approval before installation;

(c) At Delivery Acceptance, the Contractor shall supply:

(1) Operational manuals and maintenance manuals specified in Paragraph 9.2.18(a) above (to have been supplied at least six (6) weeks prior to Delivery Acceptance);

(2) Properly organised individual equipment testing results including details of test and calibration procedures;

(3) On-site commissioning test and sea trial reports of all equipment as witnessed by COMMS;

(4) The initial parameter settings and readings of all equipment at the time of the on-site commissioning test;

(5) "As installed" drawings showing the positions of all individual items of the equipment installed and the routing of the interconnecting cables between equipment;

(6) A block diagram showing the interconnections between all equipment units complete with their technical protocols and the wiring schedule;

(7) "As fitted" diagram showing the locations and positions of all circuit breakers controlling the power to the equipment; and

(8) The completed NIR Report as required by Paragraph 9.2.17(b) of this Part VII.

9.2.19 Electronic Components/Spares Parts/Spare Units/Maintenance

The Contractor shall commit to provide spare parts for the Operational Systems equipment for a period of not less than five (5) years from the date of the successful commissioning of the last Vessel.

9.2.20 Warranty Services:

(a) The Contractor shall provide a one (1) year free Warranty Period for all Operational Systems with effect from the issue date of the Acceptance Certificate in respect of the Vessel on which the Operational System is fitted;

(b) The Contractor shall rectify any fault in accordance with the requirements as specified in Paragraph 1.7 of Annex 1 to this Part VII. The Contractor shall extend the Warranty Period for any item of equipment constituting the Operational System which has broken down and required repair for a period equal to the period between the date of breakdown and the resumption of operation and service;

(c) The Contractor shall keep sufficient spare parts for Operational Systems in the HKSAR with no extra cost to Government for fulfilling the Warranty Services requirement as specified in Paragraph 9.2.20(b) of this Part VII;

(d) The Contractor shall provide and install sea chart update services when the updated versions of the sea charts are released; and

(e) The Contractor shall indemnify the Government in respect of any damages to all the HKPF equipment as specified in Paragraph 9.21 of this Part VII if the damages were caused by defects or malfunctions of the Vessel or its equipment onboard. Paragraph 1.4 of Annex 1 to this Part VII shall also apply to all HKPF equipment as specified in Paragraph 9.21 of this Part VII.

9.3 Integrated Navigation System ("INS")

9.3.1 The Contractor shall supply and install an INS to allow the officers in the following locations to switch and view the screen(s) most appropriate to the given operation that they are carrying out. (The conceptual design of wheelhouse layout can be referred to Figure 9.1 below)

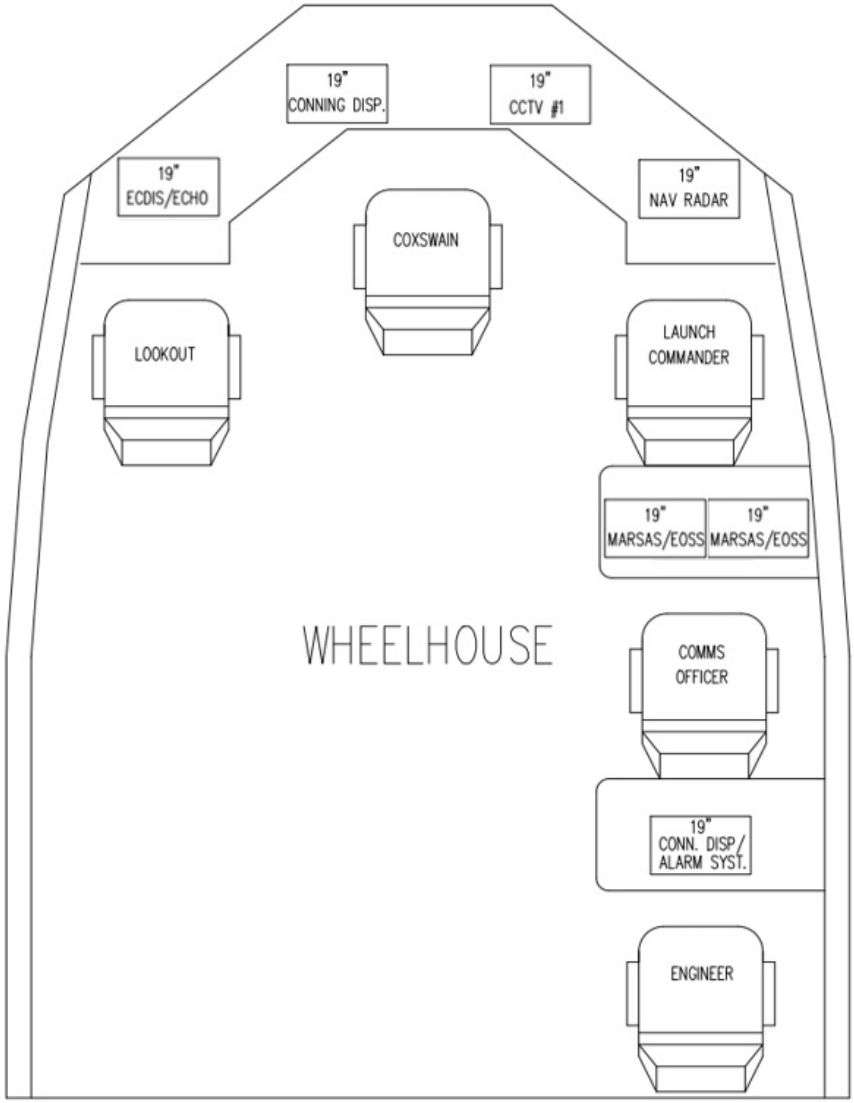


Figure 9.1 Navigation Station in the wheelhouse

9.3.2 The INS system installed in the wheelhouse include at least the control function of the following seven(7) systems:

(1). CCTV;

(2). Radar;

(3). Conning;

(4). ECDIS;

(5). EOSS;

(6). MARSAS; and

(7). MCS.

The INS shall be interchangeable. Except for the main screens of Radar and ECDIS, which can

be controlled, the other screens of INS shall only display the screens of Radar and ECDIC, and shall not be able to control them.

9.3.3 The INS shall provide the Vessel operator(s) with a user interface to be used in normal operations providing access to all data or repeated video images supplied by the Operational Systems, unless otherwise stated. The INS shall consist of the following minimum specifications:

(a) One (1) 19" or larger IMO compliant multifunction display, acceptable to HKPF, located in the wheelhouse for primarily displaying MARSAS, EOSS, ECDIS, CCTV and echo sounder information/images, forward of the lookout seated position. A joystick to control the EOSS shall be installed in the right arm rest of the lookout seat. The display is to be fitted within a console, which is to be angled such that the view on the display is not compromised by glare. The display/monitor shall have the following minimum specifications:

(1)	Native resolution:	1280 x 1024 pixels or higher
(2)	Contrast ratio standard:	1000:1 (typical)
(3)	Light intensity standard:	350cd/m² (typical)
(4)	Viewing angle standard:	±85 ° (typical) (up/down/left/right)
(5)	Max colours:	16.7 million
(6)	Multi-touch screen:	Yes

(b) Two (2) 19" or larger IMO compliant multifunction displays, acceptable to HKPF, are to be located in the wheelhouse for primarily displaying MARSAS, EOSS, ECDIS, CCTV and Conning information, forward of the communications officer seated position. A joystick to control the EOSS shall be installed in the right arm rest of the communications officer seat. The displays are to be fitted within a console, which are to be angled such that the view on the display is not compromised by glare. The display/monitor shall have the following minimum specifications:

(1)	Native resolution:	1280 x 1024 pixels or higher
(2)	Contrast ratio standard:	1000:1 (typical)
(3)	Light intensity standard:	350cd/m² (typical)
(4)	Viewing angle standard:	±85 ° (typical) (up/down/left/right)
(5)	Max colours:	16.7 million
(6)	Multi-touch screen:	Yes

(c) One (1) 19" or larger IMO compliant multifunction display, acceptable to the HKPF, located in the wheelhouse for primarily displaying conning information, CCTV and ECDIS, forward and to the left of the coxswains seated position. The display is to be fitted within a console, which is to be angled such that the view on the display is not compromised by glare. The display/monitor shall have the following minimum specifications:

(1)	Native resolution:	1280 x 1024 pixels or higher
(2)	Contrast ratio standard:	1000:1 (typical)
(3)	Light intensity standard:	350cd/m² (typical)
(4)	Viewing angle standard:	±85 ° (typical) (up/down/left/right)
(5)	Max colours:	16.7 million
(6)	Multi-touch screen:	Yes

(d) The conning information display shall display at least but not limited to the following information:

(1) Vessel speed;

(2) Distance travelled;

(3) Vessel heading;

(4) Vessel course on ground;

(5) Engine RPM;

(6) Waterjet angle and position;

(7) Fuel consumption; and

(8) Other information deemed necessary by HKPF, GNC or proposed by the Contractor during the kick-off meeting.

(e) One (1) 19" or larger IMO compliant multifunction display, acceptable to the HKPF, located in the wheelhouse for primarily displaying CCTV, ECDIS, Radar and conning information, forward and slightly to the right of the coxswains seated position. The display is to be fitted within a console, which is to be angled such that the view on the display is not compromised by glare. The display/monitor shall have the following minimum specifications:

(1)	Native resolution:	1280 x 1024 pixels or higher
(2)	Contrast ratio standard:	1000:1 (typical)
(3)	Light intensity standard:	350cd/m² (typical)
(4)	Viewing angle standard:	±85 ° (typical) (up/down/left/right)
(5)	Max colours:	16.7 million
(6)	Multi-touch screen:	Yes

(f) One (1) 19" or larger IMO compliant multifunction display, acceptable to the HKPF, located in the wheelhouse for primarily displaying Navigational radar information, EOSS, Conning information and ECDIS, forward of the launch commanders seated position. A trackball remote control unit shall be installed in the right armrest of the launch commander seat. The display is to be fitted within a console, which is to be angled such that the view on the display is not compromised by glare. The display/monitor shall have the following minimum specifications:

(1)	Native resolution:	1280 x 1024 pixels or higher
(2)	Contrast ratio standard:	1000:1 (typical)
(3)	Light intensity standard:	350cd/m² (typical)
(4)	Viewing angle Standard:	±85 ° (typical) (up/down/left/right)
(5)	Max colours:	16.7 million
(6)	Multi-touch screen:	Yes

(g) One (1) 19" or larger IMO compliant multifunction display, acceptable to the HKPF, located in the wheelhouse for primarily displaying conning/MCS/alarm system information, forward of the engineers seated position. The display is to be fitted within a console, which is to be angled such that the view on the display is not compromised by glare. The display/monitor shall have the following minimum specifications:

(1)	Native resolution:	1280 x 1024 (HD) pixels or higher

(2)	Contrast ratio standard:	1000:1 (typical)
(3)	Light intensity standard:	350cd/m² (typical)
(4)	Viewing angle standard:	±85°(typical) (up/down/left/right)
(5)	Max colours:	16.7 million
(6)	Multi-touch screen:	Yes

9.3.4 The multifunction display shall be capable of accepting navigational data from a wide selection of equipment including Differential Global Navigation Satellite System ("DGNSS"), Secure Automatic Information System ("S-AIS"), radars and satellite compass, of providing data on all tracked targets in the form of a track table. The INS shall be so configured that it is possible to select the following modes of presentation on each of the multifunction displays as specified in Paragraph 9.3.3 of this Part VII:

(a) Radar - radar image only;

(b) Radar - radar image with chart image;

(c) ECDIS - chart image only;

(d) ECDIS - chart image overlaid with radar image;

(e) Conning display; and

(f) Other system video images, including MARSAS, EOSS and CCTV etc.

9.3.5 The INS shall be connected by a dual path network(s) with all the ENE as listed in Paragraph 9.4.1of Part VII so that the data and images generated from each such ENE can be shown on the display monitors of the INS. The ENE to be connected to the INS must include ECDISs, radars, S-AIS, DGNSS, satellite compass, echo sounder, CCTV, MARSAS, EOSS and all others as listed in Paragraph 9.4.1 of this Part VII. The information and images shall be shared and viewed on all designated displays as listed in Paragraphs 9.3.3(a) to 9.3.3 (g) of this Part VII. The network(s) shall be dual path network(s) with redundancy incorporated so that no service interruption would occur in the event of any single failure in the network(s). Any necessary network security equipment including firewall, for network isolation from other onboard networks shall be provided and installed by the Contractor at no extra cost to the Government. The processing power of the network security equipment shall fit to the design requirements.

9.3.6 The INS shall have video switching functions so that the video images of all multifunction displays specified in Paragraph 9.3.3 of this Part VII can be selected and displayed on any of the designated multifunction displays in the INS. The Contractor shall provide user friendly hard panels or soft panels so that the operators can select video sources, full screen or quad-split screen formats to any multifunction displays flexibly at the location of the multifunction displays.

9.3.7 All the INS equipment except control panels shall be installed inside the cabinet or console at the installation location and be easy to access for maintenance. The cabinet or console shall be supplied and installed by the Contractor.

9.3.8 The video switching capacity of the INS shall be capable of receiving a minimum of sixteen (16) inputs and outputting to sixteen (16) displays/monitors. This is to be entirely configurable to the satisfaction of HKPF.

9.3.9 The latency of video switching of the INS for high definition video with thirty (30) frame per seconds shall be less than ten (10) ms.

9.3.10 If the Contractor adopts a video over IP solution, the transmission cables shall be Cat6e type and the network routing capacity shall be at least ten (10) gigabits. The Contractor shall use optical fibre cable and provide all necessary converters if the transmission cable length is over a one hundred (100) metres.

9.3.11 It is desirable to adopt power over ethernet for video switching equipment for the INS to minimizing the scale of cabling. **[D]**

9.3.12 The INS shall provide at least two (2) video input ports and circuits from the INS for extending MARSAS terminal videos to other display units within the Vessel as specified in Paragraph 9.21.2(e)(10) to 9.21.2(e)(11) of this Part VII.

9.3.13 The INS shall provide two (2) additional video input ports and circuits from the INS for the use of other HKPF systems.

9.3.14 All the INS multifunction displays specified in Paragraph 9.3.3 of this Part VII shall provide a direct feed to the Operational Systems input from which it is considered to be the primary display. Should there be a failure in the video switching system or INS, it shall be brought to the attention of the launch commander, via an audible and visual alarm, and the INS displays shall return to their default primary function so the Vessel can continue normal operations.

9.3.15 The INS shall support and allow the HKPF to substitute any brand and model of Operational Systems equipment in the future.

9.3.16 It is preferable that the INS is an off-the-shelf product. Otherwise, the Contractor shall provide free services for defect rectification, upgrades and system enhancements during the Warranty Period.

9.3.17 The Contractor shall submit an INS detailed design proposal that includes schematic diagrams, equipment list, equipment specifications and functional description to the HKPF, for approval within two (2) months after the Contract Date as stated in Annex 3 to this Part VII. The HKPF has the right to request the Contractor to provide a demonstration with no extra cost to the Government. The purpose of the demonstration is to prove that the proposed INS complies with the functional requirements specified in this Paragraph 9.3. The demonstration can be provided in the form of a video recording.

9.4 Description of the Electronic Navigation Equipment

9.4.1 The Contractor shall be responsible for the supply, delivery, testing, installation, commissioning and a 12-month warranty from the date of the Acceptance Certificate and provision of operational and maintenance service manuals and training for the following Electronic Navigation Equipment to be fitted onboard the Vessel and integrated with the INS:

(a) Loudhailer/Siren with USB or equivalent player and public address system;

(b) Magnetic compass;

(c) Fiber optic compass

(d) Satellite compass;

(e) IMO compliant navigation radar with ARPA;

(f) Differential Global Navigation Satellite System (“DGNSS”);

(g) Electronic Chart Display and Information Systems (“ECDIS)”;

(h) Downward facing echo sounder;

(i) Wind speed/direction sensor;

(j) Secure Automatic Identification System (“S-AIS”) transponder;

(k) Conning data collection and information display;

(l) International Maritime Mobile (“IMM”) VHF radios with GMDSS;

(m) Government mobile data equipment and antennae;

(n) CCTV system;

(o) Navigation Data Recorder ("NDR");

(p) Electro Optical Sensor System ("EOSS"); and

(q) Installation/Space/Cabling for the MRCS, MARSAS, and other special IT equipment specified in Paragraph 9.21 of this Part VII.

9.4.2 The Contractor shall provide all labour, material, transportation, installation calibration, testing and commissioning, Warranty Services during the Warranty Period and test equipment, and anything else necessary to complete the work required in this Chapter 9. References to 'Equipment' in this Chapter 9 of Part VII shall mean the above-mentioned Equipment in Paragraph 9.4.1 (a) to (q). References to "Electronic Navigation Equipment" or "ENE" throughout the Tender Documents or Contract shall mean each set of the abovementioned Equipment in Paragraph 9.4.1 (a) to (q).

9.4.3 All Equipment offered shall be designed for marine applications and shall operate effectively under adverse conditions, such as poor weather, strong winds, heavy rain, high humidity and severe vibration. Exposed components shall be weatherproof and adequately protected against water ingress to protect all electronic Equipment fitted onboard.

9.4.4 All components of each equipment exposed to the weather shall be suitably protected against the marine environment. Internal components shall be suitably protected against water/moisture ingress and incorporate sufficient heat dissipation mechanisms (e.g. ventilation, conduction) to protect the Equipment.

9.4.5 The Contractor, in the Vessel design, shall pay attention to the compass safe distance of the Equipment and the radiation hazard zone of the radar scanner. All radar and radio equipment shall be of a type approved by the Office of the Communications Authority of Hong Kong.

9.4.6 All siting, installation and cabling in respect of the compass, VHF, radar, and other appropriate Equipment shall comply with the relevant rules, regulations and laws of Hong Kong.

9.4.7 All systems and electrical appliances shall have a Hong Kong warranty with an on-site maintenance capability available.

9.4.8 When the generation/use of calendars is employed for logging of reports, activation of Equipment, or as any essential part of logic for the proper functioning of the system, then the calendar generation shall function without any error or manual intervention for all leap years.

9.4.9 The circuit breaker for the Operational Systems shall be equipped with a lockout device so that the breaker can be locked during maintenance of the Equipment.

9.4.10 Lightning protection shall be provided and installed wherever applicable. In accordance with Paragraph 4.16 of this Part VII, the lightning arresters/ dissipaters for all outdoor antennas shall be installed at the antenna ends.

9.4.11 Equipment supplied shall be complete with all standard and/or maker recommended accessories as required for normal operation.

9.5 Loudhailer/Siren with USB or Equivalent Player and Public Address System

9.5.1 The Contractor shall supply and install a loudhailer/siren system for external broadcast with a public address system for on deck and internal broadcast within the Vessel. The systems shall be specially designed for maritime purposes and shall comply with the applicable IMO requirements.

9.5.2 The loudhailer/siren system shall comprise the following:

(a) A master control unit in the wheelhouse and two (2) waterproof horn type loudspeakers, in

conformance to IP65 or higher, located in the forward and aft parts of the Vessel;

(b) Shall be capable of generating a 'Yelp' siren and a horn sound signal in manual mode;

(c) It shall also have a selection of at least four (4) warning sound signals in automatic mode, at appropriate selectable time intervals, for general marine navigational use, namely:

(1) Under power, under way and making way;

(2) Under power, under way and not making way;

(3) Towing / restricted manoeuvring;

(4) At anchor; and

(5) Others to be confirmed.

(d) The system shall incorporate at least four (4) police siren sounds namely "manual alarm", "wail alarm", "warble alarm" and "steady alarm";

(e) The system shall support MP3 and WAV audio file formats and shall allow changing siren sound patterns by updating associated audio files;

(f) There shall be a volume control for the external broadcasting speakers, which shall be adjustable from full power to a minimum level when issuing instructions to a vessel in close proximity;

(g) The master control unit, which shall include a fist microphone for delivering speech and a microphone hanger, shall be recessed and mounted in the wheelhouse control console with the following facilities provided on the front panel:

(1) Power ON/OFF;

(2) Hail volume control; and

(3) Function control.

(h) The horn type loudspeaker shall be IP65 class or higher waterproof reflex type, eight (8) ohms impedance with power rating not less than thirty (30) watts (actual rating shall match with amplifier); and

(i) A USB or equivalent player shall be provided and integrated with the loudhailer/siren system in such a configuration that the audio signal from the USB or equivalent player can be broadcast through the loudhailer/siren system. The USB or equivalent player shall at least support MP3 and WAV audio file formats. The USB or equivalent player should be equipped with an SD card drive.

9.5.3 Public Address System

(a) The Contractor shall supply and install a public address system to provide a one-way internal voice broadcast within the Vessel and to the on-deck crew from a public address system control panel installed in the wheelhouse;

(b) The public address system control panel shall have selection buttons to make all zones or selected zone announcements, a push-to-talk button to activate the microphone, a siren button to generate an alarm (all zones), a gooseneck microphone and volume control;

(c) The public address system shall provide at least two (2) zone selections as well as all zones selection. The Contractor shall discuss and confirm the definition of each zone with HKPF during the kick-off meeting;

(d) The outdoor speakers shall be fifteen (15) watts or more and at least IP66 class waterproofing. Indoor speakers shall compliant with the requirements of the IMO 2000 HSC Code. The sound volume of the speaker in wheelhouse shall be adjustable;

(e) The positions of the public address system control panel as well as the number and position

of the speakers shall be proposed by the Contractor during the detailed design stage. The Contractor shall seek comment and approval from HKPF. If this is not possible, additional speakers and associated equipment are to be fitted to the satisfaction of GNC and HKPF at no extra cost to the Government; and

(f) All the indoor areas and outdoor areas shall be covered by the public address system.

9.6 Magnetic Compass

9.6.1 The Contractor shall supply and install one (1) magnetic compass (with a spare bowl) situated at the wheelhouse at the main steering position. The compass shall be mounted in a gimbal device, in the deck head.

9.6.2 The compass shall have illumination from the primary and emergency power supply and shall be dimmable. The compass shall be provided with the required correcting device suitable for the Vessel.

9.6.3 The magnetic compass is to be supplied in accordance with requirements of any one of the RO listed in Annex 9 to this Part VII.

9.6.4 The magnetic compass shall be capable of operating without power supply.

9.6.5 The magnetic compass shall be adjustable and properly calibrated in the HKSAR. The Contractor shall supply a deviation card for the magnetic compass.

9.7 Fiber Optic Compass

9.7.1 The fiber optic compass system shall be type approved by any one of the RO listed in Annex 9 in accordance with the IMO 2000 HSC Code.

9.7.2 The fiber optic compass system shall be a fibre optic type with a settling time of less than ten (10) minutes at moor and less than thirty (30) minutes at sea.

9.7.3 The fiber optic compass system shall consist of a fibre optic compass, a control unit and a display unit.

9.7.4 The fibre optic compass system shall integrate with additional sensors including magnetic compass, satellite compass, DGNSS, speed log and external rate-of-turn gyro.

9.7.5 The fibre optic compass system shall be equipped with an automatic speed and latitude error correction suitable for the speed, motion and characteristics of the Vessel.

9.7.6 The fibre optic compass system shall be capable of connecting to other on-board navigation equipment, including but not limited to: radars, ECDIS, DGNSS, MARSAS and others through NMEA 0183 or NMEA 2000 standard interfaces.

9.7.7 Performance requirements of the fibre optic compass:

(a)	Reference:	Either magnetic north or true north.
(b)	Heading accuracy:	0.2°or better
(c)	Roll and pitch accuracy:	0.05° RMS or better
(d)	Angular rate:	>300°/s
(e)	Settling time:	At mooring: ten (10) minutes or below At sailing: thirty (30) minutes or below
(f)	Deviation compensation:	Automatic
(g)	Operating temperatures:	-10°C to 50°C or better

(h)	Waterproofing:	IP X5 or higher
(i)	Environmental:	Meets or exceeds IEC 60945
(j)	EMC:	Meets or exceeds IEC 60945
(k)	Interface:	NMEA 0183 / NMEA 2000/ IEC61162-1.

9.7.8 The display unit shall be a colour LCD and will display the true heading, speed, position in latitude and longitude, date and time and, alarms.

9.8 Satellite Compass

9.8.1 The Contractor shall supply and install one (1) complete satellite compass set. The satellite compass shall consist of at least a sensor unit.

9.8.2 The satellite compass sensor unit shall be connected to the radars, ECDIS, MARSAS and other Equipment as necessary, via a NMEA 0183 or NMEA 2000 standard interface.

9.8.3 The sensor unit shall incorporate two (2) or more satellite receivers from at least two (2) types of satellite positioning systems from GPS, GLONASS, BeiDou or Galileo.

9.8.4 The satellite compass shall incorporate integrated 3-axis rate gyro and acceleration sensors to deliver fast start-up times and shall be capable of providing heading updates during temporary loss of satellite signals (i.e. during navigation under bridges).

9.8.5 Performance:

(a)	Reference:	Either Magnetic North or True North
(b)	Warm-up time:	Less than one (1) second
(c)	Time for first fix:	Cold Start < 60s Warm Start < 30s Reacquisition < 2s
(d)	Heading accuracy:	<0.1° at 1m antenna separation
(e)	Resolution:	0.1°
(f)	Deviation compensation:	Automatic
(g)	Operating temperatures:	Sensor unit: 0 °C to 50°C
(h)	Waterproofing:	antenna: IP67.

9.9 IMO Compliant Navigation Radar with ARPA

9.9.1 The Contractor shall supply a navigation radar compliant with the latest radar performance standards of the IMO ("IMO compliant navigation radar") in the version as at the Contract Date unless the rule and regulations of the IMO specify that the version as at keel laying date of the Vessel shall apply. It shall be X-band and have an independent transceiver and scanner. The radar image is to be displayed on the displays/monitors detailed in Paragraph 9.3.3 of this Part VII.

9.9.2 General requirements of the navigation radar:

(a) The navigation radar equipment shall include:

(1) One (1) antenna;

(2) Masthead turning unit;

(3) Transceiver;

(4) Sensor interface unit;

(5) Control panel; and

(6) Panel computer inclusive of security device software.

(b) The navigation radar shall be compliant with the IMO performance standard [IMO MSC.192(79)];

(c) The navigation radar operational range shall be equal to or greater than 0.125 to 48 nautical miles minimum;

(d) The navigation radar shall provide a clear display under normal sea and rain clutter at all ranges;

(e) The radar shall have an interface to incorporate all navigational data such as latitude/longitudinal position of the Vessel given by the DGNSS receiver, satellite compass, S-AIS, fiber optic compass and other Equipment;

(f) The Contractor shall ensure that the type and provisions of the radar are appropriate to the class of Vessel;

(g) The navigation radar shall be fitted with an Automatic Radar Plotting Aid ("ARPA") which shall be capable of providing a minimum of ten (10) tracked targets. The radars shall provide data on any chosen target. All tracked targets shall support Closest Point of Approach ("CPA") with target based and Time-based Closest Point of Approach ("TCPA") features. The collision avoidance function shall be able to display 'no go areas' directly on to the radar screen;

(h) The radar shall allow the operator to set CPA and TCPA parameters/limits to highlight targets, providing the operator with a full situational awareness picture to aid the tracking of fast targets in areas of high traffic;

(i) Targets shall be capable of being displayed in an intercept mode during pursuits;

(j) The navigation radar shall be capable of displaying up to one hundred (100) AIS targets or above with up to ten (10) active AIS targets or above;

(k) The navigation radar shall be capable of displaying charts without obscuring the radar image;

(l) The radar shall be capable of supporting both automatic and manual tracking;

(m) The navigation radar shall be capable of displaying targets with both True Motion ("TM") and Relative Motion ("RM") vectors;

(n) Target information shall be capable of being communicated via NMEA 2000 (Ethernet) or NMEA0183 to the MARSAS, EOSS systems and searchlight;

(o) The transceiver shall be housed in a scanner unit and shall be designed for mounting aloft in a weatherproof housing and capable of withstanding high winds;

(p) The radar scanner unit shall be installed clear of any obstructions to minimize undue interference and Non-Ionizing Radiation ("NIR") hazards;

(q) The radar shall have an interface to incorporate and display AIS information such as vessel names, call signs, heading, destination, Maritime Mobile Service Identity ("MMSI"), latitude and longitude and other navigation data provided by the S-AIS;

(r) The Contractor shall pay special attention to any possible radar blind sectors and shall address this during the design stage and verify such after installation and rectification, if required. The Contactor shall pay special attention to the Equipment installed around the radar scanner including flood lights and/or horn speakers;

(s) The proposed navigation radar shall connect to an ethernet switch and be capable of multicasting the radar video stream;

(t) The radar shall have standard NMEA 0183 and/or NMEA 2000 (Ethernet base) interface ports to receive navigational data from a wide selection of DGNSS receivers and electronic compasses, S-AIS and to output comprehensive data such as tracked targets in the form of a track table to be available for the ECDIS and MARSAS;

(u) The Equipment shall be powered from the 220V AC system of the Vessel;

(v) The radar shall be capable of setting acquisition zones where both visual and audible alarms or warnings are activated when other vessels enter the set zone(s);

(w) The radar shall be displayed on one or more of the INS displays/monitors as specified in Paragraph 9.3.3 of this Part VII. It shall provide a clear and clutter free picture in all weather conditions and be suitable for both bright daylight and night time viewing. It shall clearly indicate important parameters such as radar targets, range marker, bearing line, heading marker, range rings, guard zones, background and other necessary information;

(x) The navigation radar shall have at least the following operational controls/features:

(1) Operator selection of North Up, Head Up, Course Up;

(2) True Motion ("TM") and Relative Motion ("RM") modes;

(3) At least four (4) different brightness levels;

(4) Information displaying Vessel's own latitude/longitude, position and speed;

(5) Trails;

(6) Range rings;

(7) At least two (2) Variable Range Markers ("VRM");

(8) At least two (2) Electronic Range and Bearing Lines ("ERBL");

(9) Manual and automatic rain and sea clutter suppression;

(10) Gain control;

(11) Range up and down;

(12) Target and own ship vectors;

(13) Centre picture, offset picture, maximum view ahead;

(14) Acknowledge alarm;

(15) Panel brilliance;

(16) Target intercept – execute intercept manoeuvres between vessels;

(17) Immediate indication of fast-moving targets;

(18) Position keeping - used to verify that vessels in a convoy are keeping to their correct position with respect to own ship;

(19) Drop line - used to define a line that is perpendicular to own ships heading. Any target moving away from own ship and crossing this line are automatically dropped;

(20) Navigation lines;

(21) Electronic cursor;

(22) Track management; and

(23) Target identification - enables the desired on-screen target ID to be displayed by selecting the target information.

(y) On the viewing side of the display unit, the following controls shall be provided:

(1) Power ON/OFF;

(2) Standby/Transmit;

(3) Automatic adjustment of gain, sea and rain clutter to tune and clearly display targets;

(4) True Motion display of the Vessel's movements relative to fixed targets;

(5) Bearing cursor rotation;

(6) Electronic Bearing Line ("EBL");

(7) Variable Range Marker ("VRM");

(8) Range scale selection;

(9) Display brilliance and illumination;

(10) Selection of background colour and target colour;

(11) Tuning; and

(12) Heading marker ON/OFF.

(z) The navigation radar shall fulfil the following minimum performance requirements:

(1)	Reference:	Magnetic and True North
(2)	Warm-up time:	< 180 seconds
(3)	Distance accuracy:	<1% of the range scale in use or 30m whichever is the greater
(4)	Accuracy:	<1°
(5)	Operational maximum wind speed:	At least 100 knots
(6)	Scanner size:	1.2m (4 feet)
(7)	Scanner rotation:	28 rpm or 45 rpm
(8)	Beam Width H/V:	≤1.5°/25°
(9)	Transceiver output power:	25kW
(10)	Operating temperatures:	external equipment –25°C to +55°C, internal equipment: –15°C to +55°C.
(11)	Waterproofing:	antenna/scanner unit: IP56 or higher

(aa) The launch commander or other operators shall be capable of selecting the following modes of presentation at the INS display:

(1) Radar image only; or

(2) Plotter image only; or

(3) Plotter image overlaid with radar image.

(bb) The navigation radar shall provide visualization and indication of conning data through an always visible section in the display.

9.9.3 The navigation radar shall equip with an Asterix category 240 video output with ethernet interface. If not possible a convertor shall be provided to convert the radar output to Asterix category 240 radar video for interfacing with MARSAS.

9.10 Differential Global Navigation Satellite System ("DGNSS")

9.10.1 The Contractor shall supply and install an IMO compliant DGNSS, which fulfils the following general requirements:

(a) The DGNSS shall integrate with radars, S-AIS, ECDIS, NDR, MARSAS and others to provide real time Vessel position and clock signal in the NMEA 0183 and NMEA 2000 formats.

(b) The DGNSS shall include the following;

(1) Compatible with GPS, GLONASS and Beidou satellite positioning systems;

(2) Receiver Autonomous Integrity Monitoring ("RAIM") functionality to provide an alert when position accuracy falls below the user pre-set limit.

(3) Displays located at the wheelhouse and anywhere else required by the HKPF;

(4) Automatic, manual or remote dimming;

(5) Integration with S-AIS, radars, ECDIS, NDR, MARSAS and others;

(6) Connectivity between DGNSS antenna/receiver and the radar for the provision of DGNSS related data, such as position fix, time, speed over ground and course over ground;

(7) Fully compatible with the radars;

(8) Support Serial NMEA 0183, Serial 26-pin D-sub, Serial 9-wire RS232, Serial 3-wire RS232 and ethernet (NMEA 2000); and

(9) The DGNSS shall support at least the following data displayed at the DGNSS multi-function LCD display units and through outputs to the INS;

(i) Position (latitude/longitude): to at least four (4) decimal points;

(ii) Horizontal position accuracy (at speed of 15 knots): less than or equal to 10m;

(iii) Course: 1˚ resolution;

(iv) Speed: 0.1 knot or 0.1 km/hour resolutions with at least three (3) digits;

(v) Date and time: selectable as GMT or local mode; and

(vi) Satellite status information.

9.10.2 The DGNSS's antenna and receiver shall fulfil the following minimum technical requirements:

(a)	Receiver Type:	8 or more channel parallel receiver
(b)	Receiving Frequency and Code:	1575.42 MHz (C/A code)
(c)	Position Accuracy:	Within + or - 30 metres rms or better 95% of the time
(d)	Warm Start Time:	Less than 30 seconds
(e)	Ambient temperature:	0°C to 55°C or better
(f)	Waterproofing:	IPX7 or better
(g)	Correction:	IALA compliant Beacon RTCM SC-104

9.11 Electronic Chart Display and Information Systems ("ECDIS")

9.11.1 One (1) independent ECDIS systems, located in the wheelhouse called navigation ECDIS. The ECDIS shall be compliant with IMO performance standards (IMO MSC.232 (82)) in the version as at the Contract Date unless the standards specify that version of the standards as at the keel laying date of the Vessel shall apply in relation to the relevant requirements specified therein. The ECDIS images shall be capable of being displayed through the INS on other multifunction display units. The location of the primary display for the ECDIS is to be agreed prior to installation onboard the Vessel.

9.11.2 The ECDIS shall display the radar, S-AIS, DGNSS, depth of water indicated by the echo sounder and navigation information in one (1) picture.

9.11.3 The ECDIS shall enable the operator to execute in a convenient and timely manner all route planning, route monitoring and positioning currently performed on paper charts. It should be capable of continuously plotting and displaying the ship's position.

9.11.4 General Requirements:

(a) ECDIS must be provided with the following functions:

(1) Navigational calculation;

(2) Chart updating;

(3) Piloting; and

(4) Voyage monitoring.

(b) The ECDIS shall be equipped with detailed navigational sea charts covering the entire Hong Kong Waters and adjacent areas;

(c) The ECDIS shall be capable of displaying information received from the S-AIS;

(d) The ECDIS shall be capable of interfacing with the radar, echo sounder, DGNSS and other Equipment attached to the INS;

(e) The ECDIS processor unit shall be capable of high-performance processing to enable rapid and responsive screen operations;

(f) The ECDIS display shall be capable of displaying radar information, radar tracked target information, S-AIS and other data layers as appropriate;

(g) The ECDIS shall provide appropriate alarms and indicators in respect of the information displayed as well as for providing Equipment malfunction alerts;

(h) The ECDIS shall be capable of direct loading and reading IHO S-57 (Version 3.1 or latest) Electronic Navigational Chart ("ENC") data files. The ECDIS shall also be capable of handling different chart formats e.g. both full and differential format versions of S-57 digital charts, SevenCs DirectENC charts, SevenCs Bathymetic ENCs, ARCS charts, VPF charts and others;

(i) The chart information used by the ECDIS shall be the latest edition at the delivery of the Vessel, which can be corrected by official updates (both full and differential format versions of S-57 digital charts, SevenCs DirectENC charts, SevenCs Bathymetic ENCs and others) produced by the Hong Kong Marine Department with the capability of displaying updates on the ECDIS; and

(j) The ECDIS shall be capable of displaying both English and Traditional Chinese characters on the ENC. The ECDIS shall be capable of storing and replaying historical information for at least the preceding twelve (12) hours.

9.11.5 Performance Requirement

(a) Navigational Features;

(1)	Total waypoints:	2000 or more
(2)	Routes:	50 route plans or more
(3)	Alarm:	including but not limited to, proximity alert, cross-track error, and arrival /anchor watch

(b) The ECDIS is to be fully compatible with the navigational radar allowing the seamless transfer of radar images, radar targets and all proximity alarms;

(c) The power supply shall be either 24V DC or 220V AC via an RO type approved UPS of an appropriate size; and

(d) Environmental

(1)	Operating temperature:	-10˚C to +50˚C
(2)	Storage temperature:	-20˚C to +60˚C

9.11.6 The Contractor shall supply the latest version of Hong Kong Electronic Navigational Chart (ENC) in IHO S-57 data format and in CD-ROM which is issued by Hydrographic Office of Marine Department of HKSAR for at least twelve (12) month to the Government and install the ENC and all ENC updates to all ECDISs. Furthermore, the Contractor shall also supply and install the latest version of South China Sea ENC in all the ECDISs.

9.12 Downward Facing Echo Sounder

9.12.1 The Contractor shall supply and install a downward facing echo sounder with the sonar unit securely installed in the Vessel below the light loaded waterline. The downward facing echo sounder shall comply with the following requirements:

(a) The equipment shall consist of transducers and retraction mechanism and casing;

(b) Shall be able to be retracted within a watertight casing so as to not protrude beyond the hull plating and thus reduce the risk of damage when landing the vessel on a beach;

(c) The measured depth shall be between 0m and 200m with at least two (2) selectable ranges to indicate shallow and deep ranges. The unit of measurement shall be selected at the front panel of the equipment;

(d) Shallow water audible and visual alarms shall be provided to indicate when the Vessel is entering an area with a water depth shallower than the pre-set depth, which should be selected on the front panel of the equipment;

(e) The accuracy of readings shall be within 1% of the measurement;

(f) The transducer shall not interfere with or be interfered by other equipment on the Vessel; and

(g) The echo sounder supplied shall be completely compatible with all systems using the NMEA 0183 or NMEA 2000 standard and be capable of interfacing through the INS with the navigational radar, multi-function displays, ECDIS, compass, DGNSS and other Equipment as necessary. The echo sounder supplied shall be connected to the INS display.

9.13 Wind Speed/Direction Sensor

9.13.1 The Contractor shall provide and install a marine type solid state ultrasonic wind speed and vane direction sensor(s). The sensor(s) shall be of high accuracy, robust as well as compact and be

mounted on the mast in an unobstructed location.

9.13.2 The sensor shall be connected with and provide data to the INS. The Contractor shall provide and install a digital display unit in the wheelhouse to provide a digital display of true and apparent wind speeds and direction.

9.13.3 The sensor shall use the NMEA 0183 or NMEA 2000 standard interface to share information with other ENE included in the INS.

9.13.4 The wind speed sensor shall fulfil the following requirements:

(a) Range: 0-120 knots or above;

(b) Accuracy: ± 2% (at 24 knots); and

(c) Resolution: 0.01 knots.

9.13.5 The wind direction sensor shall fulfil the following requirements:

(a) Range: 0-359º;

(b) Accuracy: ± 3º (at 40 knots); and

(c) Resolution: 0.1º.

9.13.6 The sensor shall fulfil the following requirements:

(a) IP rating: IP65 or above; and

(b) Input voltage: 12V or 24V DC

9.14 Secure Automatic Identification System ("S-AIS")

9.14.1 The Contractor shall supply one (1) set of S-AIS transponder to be installed on the Vessel. The model to be offered shall be specified by the Tenderer in Schedule 6.

9.14.2 The S-AIS shall be a Class A universal AIS complying with IMO MSC. 74(69) Annex 3, IEC 61993-2, ITU-R M.1371-3, ITU-R M.493-13, ITU-R M.825(DSC), IEC60945, and IEC61162-1/2. The S-AIS shall be compatible with the Sinology AIS shipborne equipment XWA-200S and base station equipment XWM-100 as confirmed by the manufacturer specifications published and available as at the Tender Closing Date to enable exchange of AIS information amongst the control centres and police launches and vessels.

9.14.3 The S-AIS shall support cipher Data Encryption Standard ("DES"), Advanced Encryption Standard ("AES") and support cipher keys:

(a) Up to 256-bits or above time limited keys;

(b) Manual keys input;

(c) Imported from portable USB memory; and

(d) External application input.

9.14.4 The S-AIS shall be equipped with internal GPS receiver, GLONASS receiver and BeiDou receiver for time synchronisation and be connected to the DGNSS system and Satellite Compass.

9.14.5 Each S-AIS shall be supplied with one (1) VHF antenna:

(a) Frequency: 149-162.5MHz;

(b) VSWR: 1.5:1;

(c) Polarization: Vertical;

(d) Max power: 100W;

(e) Impedance: 50ohms; and

(f) Surge arrestor connecting to the lightning ground of the Vessel.

9.14.6 Each unit of S-AIS shall be provided with one (1) combined VHF and GPS antenna dedicated for that unit of S-AIS. The Contractor shall provide and install suitable co-axial cable surge suppressors for the VHF and GPS antennae to protect the S-AIS from lightning surges.

9.14.7 The VHF antenna, GPS antenna and combined VHF / GPS antenna shall fulfil the following requirements:

(a) VHF band frequency: 156.025-162.025 MHz;

(b) GPS and Beidou frequency: 1575.42 MHz / 1561.098MHz;

(c) VSWR: <2:1; and

(d) Nominal impedance: 50 ohms.

9.14.8 The S-AIS shall be able to select, operate and display in at least three (3) modes of operations including but not limited to:

(a) Normal mode - function as a normal SOLAS Class A AIS broadcasting and receiving without encryption;

(b) Secure mode - only encrypted AIS data will be broadcast, both encrypted and non-encrypted AIS messages will be received; and

(c) Silent mode - no AIS will be broadcast, both encrypted and non-encrypted AIS messages will be received.

9.14.9 The S-AIS shall be equipped with a display unit for showing the S-AIS information and S-AIS equipment configuration. The S-AIS information shall also be able to display in the radar as specified in Paragraph 9.9.2(q) of this Part VII.

9.14.10 The Contractor shall provide and install a secure mode switch on the console to enable the officer to change the operational modes as specified in Paragraph 9.14.8 of this Part VII.

9.15 Conning Data Collection and Information Display

9.15.1 The INS shall collect and display the following information at the wheelhouse. The conning information screen shall be adjusted to display the information desired by an operator whether it is one of the items listed below or all. Details will be discussed in the kick-off meeting.

(a) Vessel speed GNSS and through the water;

(b) Distance travelled through the water;

(c) Vessel heading;

(d) Vessel course on ground;

(e) Engine RPM;

(f) Waterjet angle and position;

(g) Fuel consumption;

(h) CCTV; and

(i) Other information deemed necessary by the HKPF, GNC or proposed by the Contractor.

9.15.2 A recording system shall be provided to record the data as specified in Paragraph 9.15.1 (a) to (i) above. The recording capacity can store for thirty (30) days.

9.16 International Maritime Mobile ("IMM") VHF Radio with GMDSS

9.16.1 The Contractor shall supply one (1), console mounted International Maritime Mobile ("IMM") VHF radio equipped with Global Maritime Distress and Safety System ("GMDSS") functionality.

9.16.2 The positions of the one (1) IMM VHF radio are to be determined and agreed by the HKPF during the design of the wheelhouse and shall be included in the mock-up.

9.16.3 General Requirements:

(a) The IMM VHF radio shall be of a type approved by the OFCA;

(b) The radio shall be fully compatible with the GMDSS with a Class A Digital Selective Calling ("DSC") transceiver fully compliant with the IMO GMDSS carriage requirements;

(c) The radio shall be equipped with all the international maritime VHF channels with a fist microphone and press-to-talk switch or telephone handset, mic/handset hanger, mounting bracket and loudspeaker;

(d) The radio shall have a dual watch mode selection switch, incorporating Channel 16 with any other selected channel;

(e) The following functions shall be available on the front panel of the radio:

(1) Power ON/OFF;

(2) Transmit indicator, volume and squelch controls;

(3) Socket for microphone and external speaker plugs;

(4) Quick selector for Channel 16 and the programmed call channel;

(5) Channel selector and indicator;

(6) Independent dual watch mode selection switch;

(7) Transmission power selector for HIGH and LOW Power (25 W/ 1 W); and

(8) Replay the last 240 seconds or longer of received voice messages.

(f) The operating temperature range of the radio shall be -5˚C to +55˚C. The water ingress protection for the radio shall be IP X7 or higher; and

(g) The radio shall include an exterior antenna, integrated microphone, loudspeaker, control knobs/keys, display screen and all connectors and accessories to provide the functionality required.

9.16.4 Performance Requirements:

(a) Transmitter Characteristics

(1) Frequency Range:	156.000MHz to 157.425MHz, or wider
(2) Frequency Deviation:	Frequency modulation with maximum frequency deviation of +5 kHz
(3) Spurious and Harmonics:	-60dB or better
(4) RF Output Power:	Transmission power selector for: (a) High at five (5) watts nominal and (b) Low at one (1) watt nominal.

(b) Receiver Characteristics

(1)	Frequency Range:	156.000 MHz to 163.425 MHz or wider
(2)	Sensitivity:	Less than -119dBm for 20 dB SINAD or equivalent
(3)	Adjacent Channel Selectivity:	65dB or better
(4)	Spurious Image Rejection:	65dB or better
(5)	Intermodulation:	65dB or better
(6)	Audio Output:	At least 0.2 watt at rated output with less than 10% distortion.

(c) Aerial and Feeder

(1) The aerial provided shall be marine type aerial with at least 3dBi gain, vertically polarized, omni-directional and suitable for mounting on the Vessel;

(2) The VSWR of the aerial and cabling as installed shall be less than 1.5:1;

(3) The aerial feeder shall be RG58U type or equivalent; and

(4) Coaxial cable lightning suppresser with appropriate earthing connection shall be provided to protect the radio equipment. All outdoor connector joints shall be suitable for the marine environment (i.e., IP X5 or higher).

(d) Loudspeaker

(1) 6W or above.

9.17 Government Mobile Data Equipment and Antennae

9.17.1 The Contractor shall provide one (1) set of Government mobile data equipment and antennae for the MARSAS terminal in the wheelhouse and internet access for other HKPF special IT systems.

9.17.2 Each set of Government mobile data equipment and antennae shall include the following equipment:

(a) Encrypted mobile router;

(b) Antennae; and

(c) Ethernet switch(es).

9.17.3 The encrypted mobile router shall meet the following minimum specifications:

(a) Wide Area Network ("WAN") Interface:

(1) 3 x embedded 5G modem with Multi-input Multi-output ("MIMO") antennae. The model of 5G modem shall support

(i) 5G Bands: n1, n2, n3, n5, n7, n8, n12, n20, n28, n38, n40, n41, n48, n66, n71, n77, n78, n79 or more bands according to European Telecommunications Standards Institute ("ETSI") Technical Specification 38.101-1 version 15.3.0 release 15, and

(ii) LTE Bands: 2, 4, 5, 7, 14, 17, 27, 38, 39, 40, 41, 62;

(2) 1 x embedded 4G Time Division – Long Term Evolution ("TD-LTE") modem with MIMO antennae. (TD-LTE with operating frequency band between 1.785 GHz to 1.805GHz);

(3) 1 x 10/100 BaseTX gigabit ethernet; and

(4) 1 x 802.11a/b/g/n WAN interface with MIMO antennae.

(b) Ethernet interface:

(1) 8 x 10/100Base TX Fixed port with power over ethernet capabilities compliance with IEEE 802.3 at at class 4 standard bezel width less than 1 mm; and

(2) 1 x 802.11a/b/g/n interface with MIMO antennae.

(c) Requirement:

(1) Load balancing;

(2) IPv4 and IPv6 support;

(3) USB or equivalent LTE/3G Modem support (3G Bands: 1, 2, 4, 5 and 8);

(4) WAN/Mobile bandwidth bonding which is compatible with the multi-wan bonding router;

(5) IPsec VPN;

(6) 256-bit AES encryption;

(7) PPTP VPN server;

(8) QoS for VoIP; and

(9) Speed Fusion connections to existing HKPF router (Peplink380).

(d) Environmental:

(1) The encrypted mobile router specified at Paragraph 9.17.2(a) above shall be contained within a housing protected to IP67 or higher and securely locked to the Vessel. The whole housing shall be easily detachable for maintenance purposes;

(2) Operation temperature at least between -20ºC and +65ºC; and

(3) Humidity: 15% – 95% (non-condensing).

(e) The WAN modules shall be pluggable in encrypted mobile routers. The Government reserve the right to request the Contractor to change or upgrade any WAN models as specified in Paragraph 9.17.3(a) of this Part VII with no extra cost to the Government after contract award.

9.17.4 The Contractor shall provide six (6) pairs of weatherproof MIMO antennae as specified in Paragraphs 9.17.2 of this Part VII for each set of Government mobile data equipment. The MIMO antennae and feeder cables shall also support Hong Kong 5G mobile system frequency bands.

9.17.5 The weatherproof MIMO antennae for the WAN interfaces as specified in Paragraph 9.17.2(b) of this Part VII shall be installed in/on the mast or rooftop of the wheelhouse. The Contractor shall provide and install cables as well as connect the cables to the antennae and encrypted mobile router.

9.17.6 For the Government mobile data equipment dedicated for MARSAS terminal in the wheelhouse, the weatherproof MIMO antennae for ethernet interface as specified in Paragraph 9.17.2(b) of this Part VII shall be installed on the ceiling of the wheelhouse. The installation location of the MIMO antennae shall provide full Wi-Fi coverage in the wheelhouse. The Contractor shall provide and install cables, as well as connect the cables to the antennae and encrypted mobile router.

9.17.7 The Vessel's electronic equipment including the radars, DGNSS, S-AIS, electronic compass, MARSAS and ECDIS specified above and other systems as necessary, shall be connected to the Government data network by means of the encrypted mobile router specified at Paragraphs 9.17.2(a) and 9.17.3(a) of this Part VII.

9.17.8 The Contractor shall provide additional waterproof ethernet switches if more ethernet connection ports are required.

9.17.9 The Contractor shall reserve at least three (3) 10/100BaseTX Fixed ports with power over ethernet for future system use.

9.18 CCTV System

9.18.1 The Contractor shall supply and install a CCTV System to provide a 360° view of the exterior of the Vessel to assist with navigation and in particular berthing of the Vessel as well as the rear and front deck for view of operations being carried out at these locations. Interior views are to include the unmanned machinery spaces.

(a) The locations of the CCTV cameras shall be determined with the HKPF either in the kick-off meeting after the Contract has been awarded or during the design phase of the Vessel; and

(b) Unless otherwise specified, all CCTV cameras shall comply with the following minimum technical requirements:

(1) All cameras shall be IP based, high definition cameras (minimum 1920 x 1080p), waterproof to IP67 or above, vandal-resistant type, Infrared Cut Filter ("ICR") day and night dome pan-tilt-zoom cameras. They shall be of a marine type and shall be suitable for operation in a rough sea environment;

(2) All cameras shall have an image stabilization function to accommodate rough sea conditions;

(3) All cameras shall be capable of covering diagonal views using wide angle lenses or standard lenses according to the actual conditions;

(4) All camera images shall be recorded within a Network Video Recorder ("NVR");

(5) The NVR shall have sufficient disk space to archive fourteen (14) days of video images from all cameras in high definition format at thirty (30) frames per second;

(6) CCTV images shall be displayed on relevant multi-function displays on the wheelhouse and the INS. The CCTV system shall allow the operator to select exterior CCTV views of the port/starboard/ aft areas and interior CCTV images to be displayed on the overhead monitors. Interior CCTV images shall also be displayed at the coxswain's console;

(7) The CCTV system shall be equipped with a control panels or virtual control panels, installed in the wheelhouse to allow the operator to select and control the pan-tilt-zoom function of the selected camera. These requirements and number of control panels and location of control panels will be discussed further during the design phase;

(8) The CCTV system shall be capable of providing an instant playback function from the video file recorded in the NVR; and

(9) The CCTV system shall be provided with time from the DGNSS for clock synchronization, which will be displayed on the recorded images.

9.18.2 CCTV for general purpose:

(a) The CCTV system shall consist of at least sixteen (16) channels covering including but not limited to the following areas:

(1) At least one (1) cameras on the port side;

(2) At least one (1) cameras on the starboard side;

(3) At least one (1) camera facing aft for navigation purposes;

(4) At least one (1) camera facing the aft deck;

(5) At least one (1) camera facing forward to view operations on the bow;

(6) At least two (2) cameras in the engine room;

(7) At least one (1) camera in each waterjet room;

(8) At least one (1) camera outside of wheelhouse facing front for navigation purposes; and

(9) Cameras for other interior locations that will be discussed and confirmed with HKPF during the kick-off meeting.

The Contractor shall ensure that at least 95% of each area listed above is properly covered. If this is not possible, additional cameras are to be fitted to the satisfaction of GNC and the HKPF at no extra cost to the Government.

(b) A dedicated CCTV camera shall be installed in a location that best covers the area in front of the Vessel. This camera shall be a fixed camera with a wide field of view of at least 120° and with Infra-Red ("IR") Light-Emitting Diodes ("LED") enabling operations to be conducted in poorly illuminated areas or in adverse weather conditions;

(c) Control and monitoring of the CCTV system shall be performed from the wheelhouse; and

(d) The CCTV system shall integrate with the INS so that all the CCTV cameras can be displayed on any multifunction display units.

9.19 Navigation Data Recorder ("NDR")

9.19.1 A Navigation Data Recorder (NDR) shall be fitted to the Vessel for the purposes of post incident review, including the functions of data collection unit, data recording, data preservation and data analysis.

9.19.2 The NDR shall satisfy the following performance requirements:

(a) Data collection unit (DCU)

(1)	Recording period:	720 hours or better
(2)	Recorded media:	Removable solid state drive
(3)	Built in UPS:	Two (2) hours or above
(4)	Number of audio interface inputs:	Ten (10) or above
(5)	Number of serial data inputs:	Twelve (12) or above
(6)	Number of ethernet data inputs:	Seven (7) or above
(7)	Interface:	Support NMEA 0183 or NMEA 2000 (Ethernet base)
(8)	Remote Alarm Display Panel:	4.3 inches' colour LCD or better

9.19.3 The Contractor shall record all necessary items to NDR and shall include at least the following records:

(a) VHF;

(b) ECDIS;

(c) Navigation radar;

(d) DGNSS;

(e) Fiber optic compass;

(f) Downward Facing Echo sounder;

(g) S-AIS;

(h) Wind sensor;

(i) Data from MCS (details shall be finalised in kick-off meeting);

(j) Fire detection and alarm system;

(k) Watertight door/hatch indicator;

(l) Navigation & signal lights panel; and

(m) Bilge alarm system.

9.19.4 The Contractor shall provide and install a NDR alarm unit in the wheelhouse to alert the crew in the event that the NDR has failed.

9.19.5 The Contractor shall provide a laptop computer with installed playback software for extracting, recognising and playing back the recorded files and data contained therein from the NDR. Extraction of data from the NDR shall be possible via USB or equivalent. The perpetual license shall be provided if a license to use and/or update the playback software, operating system and anti-virus definition update is required. HKPF shall not be required to pay any periodic fees and charges for using the system.

9.20 Electro Optical Sensor System ("EOSS")

9.20.1 The EOSS System shall consist of the following key components:

(a) One (1) Daylight camera;

(b) One (1) cooled Thermal Imaging ("TI") camera;

(c) Laser Range Finder ("LRF"); and

(d) Pan-Tilt Pedestal with Stabilization ("Pedestal") suitable for the daylight camera, cooled TI camera and LRF.

9.20.2 Display Unit, Central Equipment, UPS and Control Panel

(a) The EOSS shall be of maritime design and be suitable for use onboard the Vessel. All outdoor equipment shall have a protection rating of IP56 or higher meeting the weather and environmental conditions expected at the operational locations. The EOSS shall be fully capable of operating in Beaufort Sea State 8 and withstanding, without damage, the effect from Beaufort Sea State 10.

(b) Each EOSS shall operate continuously with a minimum life expectancy of ten (10) years from the date of the EOSS acceptance.

(c) The EOSS shall be capable of operating in all the environmental conditions found in Hong Kong with the Contractor paying particular attention to the humid weather found during the spring, with seasonal fog and the tropical summer with frequent heavy rain. The Contractor shall refer to the information available from the Hong Kong Observatory.

(d) The Pedestal together with the cameras shall be capable of being fixed to the mast or roof of the wheelhouse. The Contractor shall propose appropriate installation locations, either on the mast or the roof of the wheelhouse for the Government representative's consideration during the implementation phase. The location of the EOSS shall take into account the position of the radars and not cause a blind spot in radar coverage.

(e) The EOSS shall be capable of providing both video and radar tracking in azimuth, selectable by the operator onboard. The Contractor shall be responsible for connecting and configuring the interface of the onboard radars.

(f) The EOSS shall be equipped with at least four (4) NMEA0183 and/or NMEA 2000 signal ports. The Contractor shall be responsible for connecting and configuring the ports with the DGNSS and gyro or electronic compass installed on the Vessel to enable the Vessel's position, heading and time information to be displayed and recorded on the EOSS images.

(g) The EOSS shall be equipped with one (1) Pelco-D standard control interface and one (1) Open Network Video Interface Forum ("ONVIF") profile S standard control interface for MARSAS control purposes with such external control functions being capable of being enabled or disabled at the EOSS control panel.

(h) The EOSS shall be equipped with one (1) additional video interface using Internet Protocol-based H.264 for integration with MARSAS.

(i) The EOSS shall always have the Vessel heading and Pedestal bearing (both azimuth and elevation) shown on the display unit(s) incorporated into the INS.

(j) The EOSS shall be designed and proven for normal viewing and observation using the daylight camera and cooled TI camera unit, without the need for frequent or day-to-day manual cleaning of lenses and viewing devices of the Equipment mounted outdoors. In case any such cleaning is required, it shall be carried out mechanically and be activated at the control panel of the EOSS.

(k) In case desiccating facilities and air or gas filling are required, the frequency that desiccators need to be changed and / or the frequency that air or gas purging needs to be carried out, under the normal operating environment, shall not be more than once every two (2) months. Change of desiccators and / or air or gas purging shall not require complicated tools or skills so that such activities can be completed within one (1) hour by a non-skilled operator.

(l) The EOSS shall be capable of selecting, at the control panel, the display of video to be derived from the cooled TI camera unit or daylight camera on the display unit. Switching of the video between the daylight camera and cooled TI camera unit shall take less than five (5) seconds.

(m) The EOSS shall have an emergency isolation switch (lockable by padlock and properly covered/protected to prevent inadvertent operation) located in the wheelhouse to shut off the power supply, including isolating the power output of the uninterrupted power supply of the EOSS, for maintenance of the EOSS equipment or in the event of an emergency.

(n) Each EOSS shall conduct self-diagnosis either when the EOSS powers up or when activated by an operator at the control panel. The self-diagnosis result shall be shown on the display unit.

9.20.3 Daylight Camera

(a) The daylight camera shall be capable of recognizing a coastal craft of twelve (12) metres in length and three (3) metres in beam, from at least seven (7) kilometres range under a visibility of ten (10) kilometres (the visibility shall follow the definitions given by the Hong Kong Observatory) based on the Johnson Criteria for determining detection and recognition ranges.

(b) The daylight camera shall have a narrow field of view of 2.3 degrees or less and wide field of view of at least thirty (30) times the narrow field of view.

(c) The daylight camera shall be able to zoom in or out continuously between the narrow and wide fields of view.

(d) The daylight camera shall have auto-defogging capability for providing clear video even under foggy or misty environmental conditions.

(e) The daylight camera shall have an auto-iris facility or quick response capability fit for various lighting conditions. The auto-iris operation shall not cause any degradation to the camera performance.

(f) The daylight camera shall not exhibit the characteristics of lagging, video retention, blooming, transfer smear or video distortion and shall have high resistance to magnetic flux.

(g) The daylight camera shall switch to black and white mode automatically under low light conditions.

(h) The daylight camera shall be mounted on the same Pedestal as the cooled TI camera unit and LRF. All power, control and video cables connecting the daylight camera with the Pedestal shall be in plug and socket arrangement for ease of future maintenance.

(i) The daylight camera shall include all necessary optical lenses that form an integral part of the EOSS.

(j) The daylight camera shall be of modular construction and the camera unit as well as casings shall be of removable type for ease of maintenance.

(k) The daylight camera shall meet the following technical requirements:

(i)	Image sensor:	At least 1/3", Colour Operation
(ii)	Active picture elements:	At least 2 megapixels
(iii)	Horizontal resolution:	At least 1,024 Lines
(iv)	Signal to noise ratio:	Higher than 50dB (weighted, AGC Off)
(v)	White balance:	Fixed or full-time automatic
(vi)	Automatic gain control:	6dB minimum, on/off selectable
(vii)	Backlight compensation:	Auto adjust, on/off selectable
(viii)	Synchronization:	Line/generation lock
(ix)	Sensitivity:	Minimum 0.4 lux for colour operation

9.20.4 Cooled Thermal Imaging (TI) Camera Unit

(a) The cooled TI camera unit shall be capable of recognizing a coastal craft of twelve (12) metres length by three (3) metres beam, at least five (5) kilometres away and detecting a person in the water at least one (1) kilometre away under a visibility reading of ten (10) kilometres (the visibility shall follow the definitions given by the Hong Kong Observatory) based on the Johnson Criteria for determining detection and recognition ranges.

(b) The cooled TI camera unit shall be capable of focusing between infinity and thirty (30) metres or less in the narrow field of view, and between infinity and two (2) metres or less in the wide field of view. When focused at infinity, it shall be capable of compensating for possible changes of focus over the operating temperature range.

(c) The cooled TI camera unit shall provide both auto and manual foci, selectable by the operator, at the control panel with an auto focus time of less than three (3) seconds.

(d) The cooled TI camera unit's temperature window shall be able to produce a full video output over a temperature range of 0°C to 50°C or better with adjustable offset from 2°C to 40°C or better.

(e) The cooled TI camera unit's average NETD per pixel shall be less than twenty (20) mK.

(f) The cooled TI camera unit's video signal shall display all pixels (at least 640 x 480) on the display unit and the EOSS shall be capable of recording video signals on the recorder.

(g) The cooled TI camera unit shall include all necessary optical lenses forming an integral part of the EOSS.

(h) The cooled TI camera unit shall be capable of operating twelve (12) hours per day, seven (7) days per week continuously, though on occasions it may be operating for twenty-four (24) hours per day.

(i) The cooled TI camera unit shall be a passive system incorporating a cooled type detector operating in the infrared band for detecting, recognizing and identifying a target through sensing its inherent thermal radiation under day or night conditions as well as in poor visibility.

(j) The cooled TI camera unit shall incorporate an integrated cooler with a life span of a minimum eleven thousand (11,000) operating hours. The EOSS shall be capable of indicating the accumulated operating hours of the current cooler of the cooled TI camera unit at the display unit.

(k) The cooled TI camera unit's detector, in the form of a focal plane array, shall have a resolution of not less than 640 x 480 pixels, a raw frame rate (frames per second) of fifty (50) or higher and operate in the three to five (3-5) micro-metres region.

(l) The cooled TI camera unit shall have a narrow optical field of view of 1.8 degrees x 1.6 degrees or smaller and a wide optical field of view of at least twenty (20) times the narrow optical field of view.

(m) The cooled TI camera unit shall be able to zoom in or out continuously between the narrow and wide fields of view.

(n) The ratio of the focal length to the useful aperture diameter of the lenses of the cooled TI camera unit shall be four (4) or less under narrow field of view.

(o) The cooled TI camera unit shall incorporate self-diagnosis which will be initiated during powering up or can be activated by the operator at the control panel. The result of the diagnosis with the various internal statuses of the camera shall be shown on the display unit.

(p) The EOSS shall have a dedicated switch at the control panel (separate from the EOSS power switch) for powering the cooled TI camera unit on or off when the EOSS power switch is turned on. In case the cooled TI camera unit is powered off, all other components except the cooled TI camera unit, shall continue to operate.

(q) Stable and good quality cooled TI camera unit video shall be displayed at the display unit within eight (8) minutes of powering up the cooled TI camera unit.

(r) When the cooled TI camera unit video is selected, the EOSS shall be capable of displaying the video images on the display unit, continuously, in real time.

(s) The cooled TI camera unit shall comply with the latest version of United States Military Standard MILSTD-810 or its equivalent in terms of shock and vibration.

9.20.5 Laser Range Finder ("LRF")

(a) The LRF shall be a laser module consisting of a laser transmitter, receiver and mechanical housing to be mounted on the Pan-Tilt Pedestal with Stabilization ("Pedestal").

(b) The LRF shall have range accuracy higher than five (5) metres for a target of size 2.5 metres x 2.5 metres positioned within six (6) kilometres.

(c) The LRF shall have a working range of up to eight (8) kilometres.

(d) The LRF shall be of an eye-safe type and comply with the IEC 60825-1 requirements.

(e) Distance shall be presented in nautical miles and metres within one (1) second on the

display.

9.20.6 Pan-Tilt Pedestal with Stabilization ("Pedestal")

(a) The Pedestal shall be a platform which can rotate in both the azimuth and elevation directions and be fitted with purpose designed payload brackets to carry the TI and daylight cameras.

(b) The Pedestal's slew rate in both azimuth and elevation shall be higher than one hundred (100) degrees/second and the acceleration higher than one hundred and fifty (150) degrees/second without backlash.

(c) The Pedestal's azimuth travel limit shall not be less than three hundred and sixty (360) degrees and the elevation travel limit not less than thirty (30) degrees up and twenty (20) degrees down with stoppers to prevent any limit violations.

(d) The Pedestal shall have an electro-mechanical stabilizer of line of sight angular stabilization better than 0.4mRad.

(e) The Pedestal shall have point accuracy in both azimuth and elevation better than 0.1mRad.

(f) During operations, the pedestal shall maintain a visible fluctuation of less than 1/50 of both the vertical and horizontal sizes of the display unit under the narrow field of view of both the daylight and cooled TI camera units for a coastal craft (twelve (12) metres long by three (3) metres beam) at five (5) kilometres distance.

(g) The Pedestal's free drift shall be less than fifteen (15) degrees per hour.

(h) The EOSS shall have a 'Home' switch on the control panel. When activated by the operator, it shall lock the Pedestal in the horizontal and forward position with respect to the Vessel. In the 'Home' position, the operator shall be able to select video from either the TI or daylight camera to be shown at the display unit.

(i) The EOSS shall have a 'Stow' position in which the pedestal shall be locked in the stow position automatically when the EOSS is powered off. The stow position shall be a safe position which safeguards the Pedestal and cameras against strong winds and also safeguards both the daylight and cooled TI camera unit detectors from exposure to direct sunlight via the lenses.

(j) The Pedestal shall have the following modes selectable by the operator:

(i) Manual: Manual control of pan and tilt; and

(ii) Stabilized: Stabilized against roll, pitch and yaw of the Vessel.

(k) The Pedestal's current pan and tilt angles shall be shown on the display unit.

9.20.7 Display Unit, Central Equipment, Uninterrupted Power Supply and Control Panel

(a) The central equipment, including the control panel, shall be located in the wheelhouse where an operator will control and operate the EOSS. The control panel shall be fitted with necessary control buttons, joystick, indicators and displays, with ergonomic consideration as appropriate, to control the equipment mounted on the pedestal.

(b) The following functional switches / controls shall be available on the EOSS control panel for the operation of the EOSS:

(i) Power on/off switch for the EOSS with protection cover;
(ii) Power on/off for the cooled TI camera unit with protection cover;
(iii) Gain control for the cooled TI camera unit;
(iv) Offset control for the cooled TI camera unit;
(v) Video polarity for the cooled TI camera unit;
(vi) Focus control for the cooled TI camera unit and daylight camera;
(vii) Button control for pan and tilt, in addition to joystick control;
(viii) Pan and tilt sensitivity control for the joystick;
(ix) Daylight camera mode switch (colour or black/white mode);
(x) Tracking control for video and radar tracking;
(xi) Stabilization on or off;
(xii) Pedestal 'Stow' control;
(xiii) Pedestal 'Home' control;
(xiv) Video recording and playback controls;
(xv) Main menu control;
(xvi) EOSS diagnosis button; and
(xvii) Joystick.

(c) The following functional switches and controls shall be available on the joystick of the EOSS control panel:
(i) Pan and tilt control;
(ii) Zoom control for the cooled TI camera and daylight camera;
(iii) Daylight camera or TI camera selector switch; and
(iv) Activation for the LRF.

(d) The display unit shall show a polygon display with the direction of the Vessel heading and the TI and daylight cameras. The polygon shall be displayed in North Up or Head Up mode as per the operator's selection.

(e) The display unit shall present the video from the daylight or cooled TI camera units on the screen simultaneously and shall be capable of presenting in picture-in-picture mode whereby the main window and a small window shall present the daylight and cooled TI camera unit respectively or vice-versa.

(f) The display unit shall present the following information, inter alia, on the screen:
(i) GNSS position (latitude and longitude) of the Vessel;
(ii) GNSS position of the target when the tracking function is on;
(iii) Elevation and zoom level of the TI and daylight cameras;
(iv) True bearing of the pedestal / bearing to observed target; and
(v) GNSS derived local date and time.

(g) The uninterrupted power supply shall comply with the IEC 61000 and IEC 62040 standards. It shall be able to provide at least thirty (30) minutes backup power to the EOSS in case of mains failure.

9.20.8 Video Player and Recorder

(a) The video player and recorder shall be a high-quality surveillance player and recorder supporting at least H.264 compression suitable for installation onboard the Vessel.

(b) Performance requirements:

(i) The video player and recorder shall be self-contained with minimum controls and indicators for the following functions: RECORD, PLAY, STOP PAUSE, FAST FORWARD and REVERSE, and be such that it can be operated by personnel unskilled in video and audio recording.

(ii) The video player and recorder shall have an integrated solid-state drive hard disk with storage capability for at least three hundred (300) hours of video with a first-in-first-out overwriting function once the disk is full.

(iii) The video player and recorder shall have password protection and watermark data authentication security features.

(iv) The video player and recorder shall support resolution of at least 1280 x 1024 pixels for the daylight camera, 640 x 480 pixels for the cooled TI camera unit and a frame rate of thirty (30) frames per second or more.

(v) The video player and recorder shall be high-speed quick start type so that the hard disk can be ready for recording within one (1) minute after the power is switched on.

(vi) The video player and recorder shall have high speed copying function for backing up videos from the hard disk to USB 2.0 flash drive and SD card. This is to be discussed with and agreed by HKPF.

(vii) The recorded signal shall include the date and time, video and other information shown on the display unit. The recording shall be capable of being timed or activated as and when required.

(viii) The video player and recorder shall have the means for recording voice via a high-quality boom-type microphone provided by the Contractor onto a recorded video.

9.20.9 Video Tracking

(a) The EOSS shall have a video tracking function such that it shall control the Pedestal to track and follow a target of size one hundred and twenty (120) pixels or more (under any optical field of view) captured either by daylight or cooled TI camera unit and selected by an operator. The target shall be presented at the centre of the display unit.

(b) The EOSS shall track, follow and keep the target shown at the centre of the display unit continuously with the target not less than one (1) kilometre away from its own position and travelling at not more than ninety (90) knots relatively.

(c) To activate this function, the operator shall press the ‘Video Track’ button on the control panel and the EOSS shall respond by opening a separate track window on the display unit. The operator shall then use the joystick to control the track window to capture the target, confirm to the EOSS by pressing the ‘Lock’ button of the control panel and the EOSS shall respond with an indication on the control panel showing that it is in video tracking mode. To de-activate the tracking function, the operator shall press the ‘Release’ button on the control panel.

(d) In case the target is blocked by other objects after tracking commences, the EOSS shall be capable of predicting the route of the target based on the track and speed before being blocked and lock onto the target again once the obstruction has passed.

9.20.10 Radar tracking for integration with MARSAS

(a) The EOSS shall have a radar tracking function which enables an operator to select any target from potential targets identified by either the surveillance or navigation radar and displayed on the display unit. A pull-down menu showing the radar tracks available is to be shown on the display, after selecting a target, the EOSS shall then track the target.

(b) The EOSS shall track through the NMEA 0183 and NMEA 2000 interfaces, follow and

display at the vertical centre line of the display unit continuously any target not less than one (1) kilometre away relative to the Vessel, travelling at not more than ninety (90) knots. The operator shall adjust the tilt manually (i.e. elevation) to display the target in the centre of the display unit in elevation.

(c) A 'Radar Track' button on the control panel shall be provided for enabling the radar tracking function as specified in Paragraph 9.20.10 (a). A 'Release' button of the control panel shall be provided for de-activating the radar tracking function. There shall be an indicator overlaid on the video footage on the display indicating that the radar track function is enabled.

9.20.11 The Contractor shall ensure that the EOSS can be directly shipped to and from Hong Kong and the supplier before and after maintenance and servicing. Otherwise, the EOSS is to be shipped from the supplier direct to and fitted in Hong Kong.

9.21 Installation/Space/Cabling for MRCS, MARSAS, and other Special IT Equipment

9.21.1 At no extra cost to the Government, the Contractor shall install onto the Vessel with one (1) HKPF Marine Radio Communications Systems ("MRCS") radio terminal and one (1) MRCS handheld radio including 1-bay battery charger to be located at the Communication/Navigation Officer Console in the wheelhouse, in accordance with the following:

(a) The present equipment is TErrestrial Trunked RAdio ("TETRA") mobile radio with separate control panel and speaker box. The MRCS radio terminal is a wide-band version with a frequency range of 380 MHz to 430 MHz and is powered by a +12V DC nominal supply. The HKPF will provide exact model of the MRCS radio terminal, at least three (3) months in advance of the on-site installation of the MRCS radio terminal. No additional costs associated with the installation of a radio of a different type shall be chargeable to the Government; and

(b) The Contractor shall:

(1) Reserve sufficient space for the installation of the MRCS radio terminals by COMMS of the HKPF;

(2) Supply mounting brackets for the MRCS radio installation;

(3) Supply and install all RF signal, power and grounding cables and wires. COMMS will provide the specifications of all the RF cables and connectors to the Contractor;

(4) Supply and install all power converters and power supply terminals necessary for the MRCS radios installation; and

(5) Supply and install one (1) UHF antennae, one (1) each for the MRCS radios. The UHF antennae shall have an impedance of 50 ohms, unity gain and a frequency range of 380 MHz to 430 MHz at a VSWR of 1.5 or less. The Contractor shall provide and install suitable co-axial cable surge suppressors to these UHF antennae to protect the radio equipment from lightning surges.

(c) COMMS shall:

(1) Supply the MRCS radios and accessories;

(2) Connect up the MRCS radios and accessories using the connectors, cables and wires installed by the Contractor;

(3) Test the VSWR of the RF cables and UHF antennae to confirm that neither exceeds 1.5; and

(4) Commission the MRCS radios.

9.21.2 The Contractor shall facilitate the installation by the HKPF MARSAS contractor of one (1) on-board MARSAS equipment and one (1) MARSAS terminal to be interfaced with the INS, where approved and displayed on the multi-function displays in the wheelhouse. MARSAS can be installed later as the installation of MARSAS is under HKPF or HKPF's other contractor scope but the Contractor is required to supply infrastructure for MARSAS as stated in this Paragraph 9.21.2. This same requirement shall apply to any other equipment expressly stated to be provided by HKPF in this Chapter 9. The conceptual system interface diagram between the Vessel and MARSAS (see Figure 9.2 below) illustrates the system integration, comprising the following;

(a) The on-board MARSAS equipment shall include, but not be limited to, Local Processing Unit ("LPU"), radar signal converter, NMEA Converters, video encoders and batteries. The MARSAS terminals shall include a maritime Vessel Workstation, keyboard, mouse and speakers;

(b) The MARSAS terminals/equipment and associated equipment shall be installed in the wheelhouse;

(c) The on-board MARSAS equipment, including the MARSAS terminals, will be powered by 200V to 240V AC and / or 24V DC;

(d) The MARSAS terminal shall be installed in console table in the wheelhouse;

(e) The Contractor shall:

(1) Coordinate and finalize the positions of the on-board MARSAS equipment and the MARSAS terminals with HKPF during the detailed system design stage of the Vessel;

(2) Supply at least one (1) equipment rack in the wheelhouse for the installation of the MARSAS equipment and reserve sufficient space in the wheelhouse for the installation and integration of the MARSAS terminal;

(3) Supply and install all power, grounding and data cables. COMMS will provide the specifications of all the cables and connectors to the Contractor;

(4) Supply and install all power converters and power supply terminals necessary for the on-board MARSAS equipment and MARSAS terminals installation;

(5) Ensure that all the cable trunks shall be accessible and allow unimpeded access for the HKPF MARSAS contractor to install cables as necessary;

(6) Provide an Asterix Category 240 ethernet interface for the radar as specified in Paragraph 9.9.3 of this Part VII and provide an interface from radars that provide MARSAS with radar video signal, trigger, azimuth count pulse and azimuth reset pulse from the radars;

(7) Provide navigational information, including but not limited to DGNSS, satellite compass and AIS in NMEA 0183 and / or NMEA 2000 (Ethernet base) interfaces;

(8) For the MARSAS terminal, provide one (1) Pelco-D standard control interface and/or one (1) ONVIF profile S standard control interface from the EOSS as specified in Paragraph 9.20.2(g) of this Part VII for the MARSAS control of the EOSS;

(9) Provide one (1) ethernet interface from the EOSS for both the daylight camera video and TI camera video;

(10) For the MARSAS terminal, provide two (2) video input ports from the INS to extend MARSAS terminal videos to other display units within the Vessel;

(11) For the MARSAS terminal, provide one (1) video input port in the MARSAS display unit and the EOSS display unit as specified in Paragraph 9.3.3 of this Part VII for the direct connection of the MARSAS terminal video to the one (1) display unit;

(12) Ensure that the MARSAS display unit and EOSS display unit can be displayed on all

multi-function displays in the wheelhouse via the INS;

(13) Provide one (1) 10/100BaseTX Fixed port from the encrypted mobile routers of the MARSAS terminal at the wheelhouse as specified in Paragraph 9.17.2(a) of this Part VII. This ethernet port shall be located in the MARSAS equipment rack in the wheelhouse;

(14) For the MARSAS terminal, other than the mouse and keyboard of the MARSAS terminal, provide one (1) USB female type socket flush-mounted with cover on the MARSAS console including extension cable with male type plug for connection to the MARSAS terminal. The cable length shall be sufficient to connect to the MARSAS terminal;

(15) For the MARSAS terminal, provide one (1) pair of loud speakers flush-mounted on the MARSAS console including power and extension cable with one (1) male type 3.5mm audio port for connection to the MARSAS terminal. The cable length shall be sufficient to connect to the MARSAS terminal;

(16) Provide one (1) Cat6e ethernet cable terminating at an RJ-45 male connector from the MARSAS equipment rack in the wheelhouse to the MARSAS terminal in the wheelhouse; and

(17) All Operational Systems interface ports locations and types for MARSAS terminals shall be discussed and confirmed during the kick-off meeting. The signals drawn from these interface ports for the MARSAS shall not affect the normal operation of the corresponding command and control system.

(f) COMMS shall:

(1) Supply the MARSAS terminals and accessories;

(2) Install and connect up the MARSAS terminals and accessories using the connectors, cables and wires installed by the Contractor; and

(3) Commission the MARSAS terminals with the core MARSAS system.

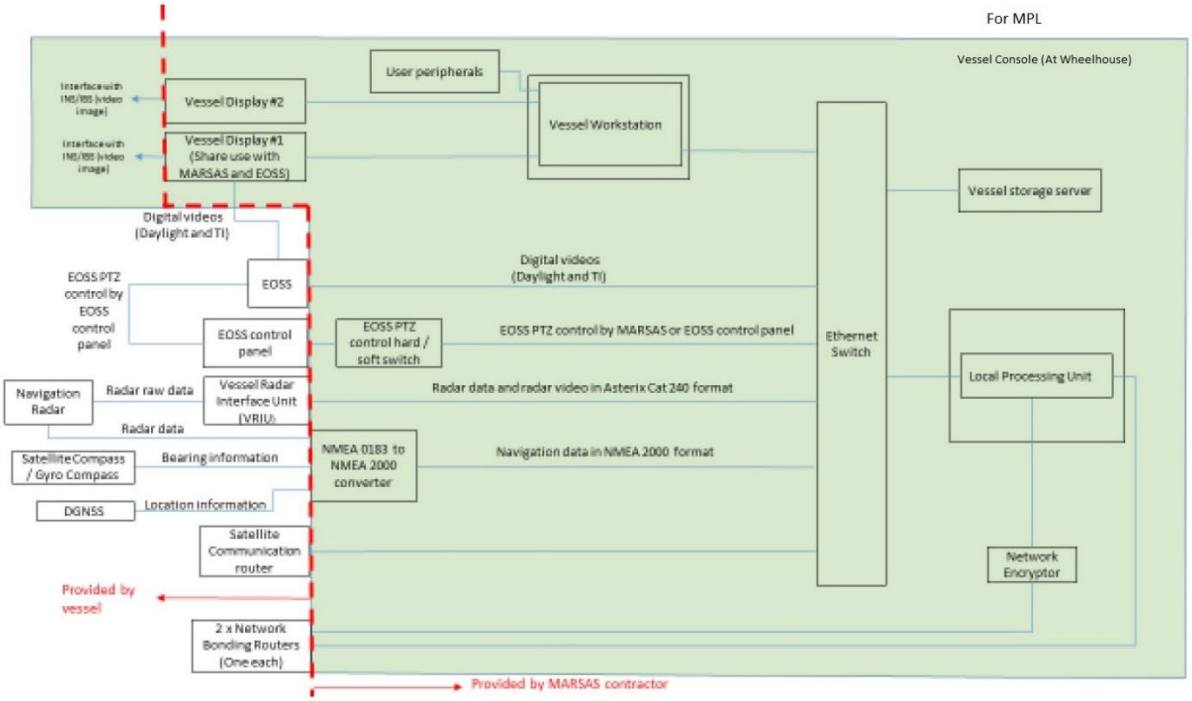


Figure 9.2 - Conceptual system interface diagram between the Vessel and MARSAS

Chapter 10 Services and Support

10.1 General Requirements

10.1.1 In determining the appropriate design for the Vessel, all of the following factors shall be taken equally into account:

(a) Vessel performance;

(b) Operational requirements;

(c) Initial cost;

(d) Through life operational costs (e.g. maintenance cost, fuel consumption, spare parts);

(e) Reliability (frequency and time to repair);

(f) Time between maintenance periods;

(g) Time to undertake scheduled maintenance (downtime); and

(h) That all machinery and Equipment installed in the Vessel shall be serviceable in the HKSAR.

10.1.2 Maintainability – the Vessel shall be easy to maintain by ensuring that there shall be:

(a) Good access to all installed items for monitoring service and overhaul; and

(b) Easy access to in-situ service and maintenance within HKSAR.

10.1.3 Allowable Vessel downtime (including scheduled preventive maintenance and unscheduled repair and maintenance) shall not exceed 10% of the total hours of operation per month based on the operational profile as specified in Paragraph 2.7.2 of this Part VII.

10.2 Information to be Provided Prior to and at Delivery Acceptance

10.2.1 Not later than six (6) weeks prior to Delivery Acceptance, the Contractor shall supply the Inventory List to the GNC and HKPF for approval. The detailed Inventory List shall be for the whole Vessel, covering all discrete items down to major component/unit level. Full details of each item shall include:

(a) Item number;

(b) Description;

(c) Type or model (if applicable);

(d) Serial number(s);

(e) Quantity;

(f) Manufacturer;

(g) Manufacturer’s reference number;

(h) Location of the item in the Vessel;

(i) Local agent/supplier address, telephone and facsimile numbers as well as email address;

(j) Order lead time;

(k) Shelf life; and

(l) Unit cost.

10.2.2 In addition, the documents for the Operational Systems shall be provided as described in Paragraph 9.2.18 in this Part VII.

10.2.3 In conjunction with the Inventory List, to facilitate good stores management and scheduling practices, the Contractor shall supply with the Vessel an integrated through life maintenance and support package, excluding the Spare Parts listed in Part 2 of Schedule 1, that shall be for the expected service life of the Vessel and will include, but not be limited to, the following:

(a) A list of recommended spare parts to be stored on the Vessel that may be required for preventive maintenance and consumable replacement;

(b) A list of recommended spare parts to be stored at the base from which the Vessel operates to facilitate frontline preventative maintenance and replacement of consumable parts which cannot be undertaken when operating at sea;

(c) A list of recommended spare parts to be stored at the base from which the Vessel operates as replacement for items that can be anticipated to be required and the interval at which they will likely be required;

(d) A list of recommended spare parts to be stored at the Government Dockyard in anticipation of replacement and the interval at which they will be required;

(e) A list of recommended software to be supplied at the Government Dockyard in anticipation of troubleshooting and the interval at which they will be required;

(f) The schedule of maintenance and parts required;

(g) Lead time for delivery of major parts that may be required for replacement during scheduled maintenance;

(h) The RO's design and construction inspection certificates for the waterjet propulsion units shall be submitted to GNC before the Delivery Acceptance; and

(i) Other details the Contractor deems relevant.

10.2.4 "As Fitted" Plans and Drawings, in accordance with those given in (but not limited to) Annex 7 to this Part VII and any other relevant information required by GNC, shall be supplied to GNC for acceptance not less than four (4) weeks before the Delivery Acceptance of the Vessel. Four (4) hard copies of the final version of the "As fitted" Plans and Drawings and two (2) soft copies on USB or equivalent devices shall be provided by the Contractor to GNC upon delivery of the Vessel to Government Dockyard.

10.2.5 The first draft of the Onboard Operator's Manual (in both English and Traditional Chinese) mentioned in Paragraph 10.2.6(g) of this Part VII shall be submitted to GNC for approval one (1) month before the documentation acceptance.

10.2.6 At Delivery Acceptance, the Contractor shall provide GNC with the following:

(a) Four (4) printed copies and two (2) soft copies on USB or equivalent devices of the approved Inventory List and the integrated through life maintenance and support package;

(b) Four (4) complete sets of printed copies and two (2) soft copies on USB or equivalent devices "as fitted" drawings of the Vessel;

(c) Four (4) complete sets of printed copies and two (2) soft copies on USB or equivalent devices "as fitted" mechanical and electrical equipment and schematics of cabling, wiring and single line diagrams for all electrical and electronic equipment installed onboard and conduit / trunk route diagrams as per the Vessel delivered;

(d) Four (4) printed copies and two (2) soft copies on USB or equivalent devices of a list of all bought-in machinery and electrical equipment installed on the Vessel. The list shall include:

(1) Description,

(2) Type or model (if applicable);

(3) Makers part number or equivalent (if applicable);

(4) Location;

(5) Quantity;

(6) Supplier or agents name and contact details;

(7) Order lead time;

(8) Shelf life; and

(9) Unit cost.

(e) Four (4) printed copies (at least one (1) original) and two (2) soft copies on USB or equivalent devices of manufacturers' operation, maintenance and workshop manuals in English for all machinery and equipment, including spares and stores, special tools, outfitting items and test equipment;

(f) Four (4) printed copies and two (2) soft copies on USB or equivalent devices of the Contractor's "Docking Plan", which shall include the profile, plan and sections as per the Vessel delivered;

(g) Four (4) printed copies and two (2) soft copies on USB or equivalent devices of the Onboard Operator's Manual (English and Traditional Chinese) for the Vessel delivered covering:

(1) Daily user checks and operating procedures;

(2) Operating detail of each system; and

(3) Emergency operation procedure.

(The precise format and detail required shall be subject to the Government's approval when the configuration of the Vessel and outfitting is decided.); and

(h) One (1) set in paper format and one (1) softcopy on USB or equivalent device of the operational and maintenance manuals in English as specified in Paragraph 9.2.18 of this Part VII for each individual item of equipment that comprises the Operations System. For the avoidance of doubt, this set of operation and maintenance manuals is in addition to the sets which are required to be supplied in accordance with Paragraph 9.2.18 of this Part VII.

10.2.7 Spare Parts and Consumable Parts for the Main Diesel Engines:

(a) All items of Spare Parts and consumable parts for the main diesel engines shall be delivered to the Government Dockyard as per the requirements stipulated in Schedule 2, Delivery Schedule of Part V;

(b) All items supplied shall be identical in make, quantity and size to the parts currently in use; and

(c) All items shall be properly documented, preserved and packed.

10.2.8 Tools and Test Equipment for Electronics

(a) All tools and testing equipment for the Vessel's electronic equipment shall be delivered directly to COMMS; and

(b) All items shall be documented, preserved and packed properly.

10.2.9 Photographs

The Contractor shall at Delivery Acceptance provide the following:

(a) As-Fitted Photographs

(1) Two (2) sets of colour prints (130 mm x 90 mm) from different aspects to give an overall picture of the various parts/areas of the Vessel. Two (2) high resolution soft copies of As-Fitted photographs shall also be provided; and

(2) Each set of prints shall be presented in a suitable album, indexed and labelled appropriately to ensure that the position from which the picture was taken and the position of the subject in the picture are clearly identifiable.

(b) Official Photographs

(1) Four (4) framed colour photographs of picture size not less than 350 mm x 270 mm and a frame size not less than 510 mm x 400 mm showing the clearly the running profile and the name of the Vessel in Hong Kong waters;

(2) Four (4) 200 mm x 150 mm colour photographs showing the profile of the Vessel in Hong Kong waters; and

(3) Four (4) 150 mm x 100 mm colour photographs showing the profile of the Vessel in Hong Kong waters.

(c) Softcopy of Photographs

(1) All of the photographs specified at sub-paragraphs (a) and (b) above shall be taken using a digital camera with a resolution of at least twelve (12) megapixels and be forwarded to GNC on two (2) USB or equivalent devices in RAW and JPEG formats at Delivery Acceptance.

10.2.10 Certificates and Reports

Copies of the following documents (one (1) original with two (2) copies and two (2) soft copies stored on USB or equivalent devices), filed in clear folders, shall be forwarded to GNC at Delivery Acceptance:

(a) Associated test certificates;

(b) Equipment test performance certificates (e.g. electronics, switchboards, etc.);

(c) Main diesel engines performance test certificates;

(d) Complete record of the commissioning tests;

(e) Original copy of the warranty certificates of all machinery, equipment and apparatus on the Vessel (valid for twelve (12) months from the date of Acceptance Certificate of the Vessel);

(f) Certificates of light and sound signalling equipment;

(g) Builder certificates;

(h) Certificates of building materials;

(i) Deviation card for compass (after adjustment in the HKSAR);

(j) Hull construction material issued by the RO;

(k) Undertaking duly signed and sealed by the Contractor's (or its Sub-contractor's) shipyard for providing Warranty Services in relation to all aspects of the Vessel during the Warranty Period in the HKSAR as stipulated in Annex 1 of this Part VII - Technical Specifications;

(l) Certificate of Class issued by the relevant RO; and

(m) Any other certificates as appropriate to discretion of GNC.

10.2.11 Spare Parts and Warranty Spare Parts

(a) In accordance with the delivery time specified in Schedule 2, the Contractor shall deliver

all quantities of all items of Spare Parts in Ready for Use condition and delivered to the Government Dockyard. All these Spare Parts must have undergone all parts of the Technical Acceptance and Delivery Acceptance.

(b) In respect of the first Vessel to be delivered, the Contractor shall deliver the Warranty Spare Parts in Ready for Use Condition to the shipyard or storage facility of the Contractor's local agent for Delivery Acceptance by GNC and HKPF. The delivery shall be delivered together with the first Vessel as part of the Delivery Acceptance for that Vessel. All these warranty Spare Parts must have undergone all parts of the Technical Acceptance and Delivery Acceptance before passing the same to the local agent for the Warranty Services as mentioned in paragraph 1.11 of Annex 1 to this Part VII.

10.2.12 Ship model

(a) The Contractor shall supply three (3) ship models on for display and training purpose. All models are with a scale of 1:50.

(b) The purpose of the ship model shall provide a reasonable realistic appreciation to the viewer (who cannot see the actual vessel) of the shape, scale, construction of the Vessel and the machinery installations and fittings therein.

(c) The ship model shall include the position and appearance of the major external fittings including but not limited to the ship hull, superstructure, ship name and number, skeg, appendages, shafts, waterjet, fender, windows and wipers, lifesaving, fire-fighting, piping on deck, mast, mast fittings, radar, navigation lights etc. to the satisfaction of the Government. The ship model shall be made to an exact overall scale standard to the Vessel.

Chapter 11 Training

11.1 General

11.1.1 This chapter stipulates the training requirements for (a) Launch Mechanic (Engineering Stream) Operational Crew Training, (b) Engineering Maintenance Training (c) Deck Operational Crew Training, (d) ENE Maintenance Training and, (e) Other Trainings of the Vessel that shall be recommended and provided by the Contractor. The trainings shall be delivered by qualified Contractor's own experienced trainers.

11.1.2 Each training course is to provide the participants, all of who are experienced navigation and engineering professionals, with the level of knowledge to undertake the role of instructor to train operational crews to operate and/or maintain the Vessel and its systems.

11.1.3 'Vessel' for the purposes of the courses mentioned in this Chapter 11 refers to the mother launch only.

11.1.4 All training courses shall include, but not be limited to, the following:

(a) Layout and structure of the Vessel;

(b) Introduction of all onboard equipment;

(c) Equipment construction and mounting;

(d) Working principles, function and operation of all equipment;

(e) Equipment block and schematic diagrams as well as functional descriptions;

(f) Equipment adjustment/calibration procedures and parameter settings;

(g) Equipment interfacing/networking; and

(h) Preventive maintenance and trouble-shooting.

11.1.5 The Contractor shall provide both classroom-based and vessel-based training, as appropriate. All training courses shall be held in the venue to be provided by HKPF or GNC in the HKSAR. The training shall be conducted in Cantonese, or English through an interpreter who possesses marine technical and engineering knowledge, with relevant training materials supplied by the Contractor.

11.1.6 If any of the training instructor(s), trainer(s), and any other personnel providing the training are travelling from outside Hong Kong, all the training shall be provided by such personnel in one visit for each set of training.

11.1.7 The training courses as specified in Paragraph 11.1.1 above shall be provided immediately after the Delivery Acceptance of the first (1st) Vessel to the MD. Any engineering/operational systems upgrade that have been implemented during the construction of the second (2nd) Vessel shall be supplemented to and reflected in the training notes/ operator's manual.

11.1.8 The Contractor shall supply each participant attending a course with one (1) copy of the comprehensive training documents in both English and Traditional Chinese in both printed copy and USB or equivalent format.

11.1.9 The Contractor shall submit copies of the training syllabus and training materials to the HKPF and GNC for acceptance two (2) months prior to Delivery Acceptance, which shall cover all corresponding aspects of boat handling and onboard Command, Operational and Engineering Systems. This shall include "hands on" demonstrations of the operation, daily routine, as well as first level troubleshooting and maintenance. The training syllabus shall include details of the scope, duration and scheduling of the proposed training course and the qualifications possessed by the proposed training instructor(s). The HKPF and GNC shall have the right to reproduce all

training documents for internal use.

11.1.10 The Contractor shall, upon successful completion of each course, issue each participant with a certificate as evidence of his/her attendance and the standard of competence achieved.

11.2 Launch Mechanic (Engineering Stream) Operational Crew Training

11.2.1 The purpose of the Launch Mechanic (Engineering Stream) Operational Crew Training Course is to provide each participant, who will already have completed the requisite HKPF training and be an experienced Launch Mechanic (Engineering Stream) operational crew member, with the knowledge and competence to fully operate and maintain the Vessel and all its equipment and mechanical and electrical engineering machinery whilst on operational duties. On completion of the training course, the participants shall be capable to deliver further training courses to other HKPF officers.

11.2.2 Upon Delivery Acceptance, the Contractor shall then deliver this training course according to the approved syllabus to HKPF operational staff as follow:

(a) Thirty (30) staff at the first (1st) Vessel Delivery (shall be separated into multiple classes as required by HKPF and GNC);

(b) Twenty (20) staff at the fourth (4th) Vessel Delivery; and

(c) Twenty (20) staff at the eleventh (11th) Vessel Delivery.

11.3 Engineering Maintenance Training

11.3.1 The purpose of the Engineering Maintenance Training Course is to provide the HKPF and GNC technical and maintenance staff with a comprehensive knowledge and understanding of all aspects of the design philosophy, integrated system operation, fault diagnosis, trouble shooting, routine maintenance, repair or replacement procedures of all mechanical and electrical machinery onboard as well as hull and structural repairs to the Vessel. This course shall provide the participants with sufficient expertise to enable them to effectively maintain and repair the Vessel and all mechanical and electrical onboard systems after the expiry of the Warranty Period. It shall include both practical demonstrations and hands on training.

11.3.2 The Contractor shall then deliver this training course to HKPF and Government Dockyard Maintenance and Support Section ("GDMSS") technical and maintenance staff as follow:

(a) Twenty (20) HKPF and ten (10) GDMSS staff at the first (1st), sixth (6th) and eleventh (11th) Vessel Delivery (shall be separated into multiple classes as required by HKPF and GNC).

11.4 Deck Operational Crew Training

11.4.1 The purpose of the Deck Operational Crew Training Course is to provide each participant, who will already have completed the requisite HKPF training and be an experienced deck operational crewmember, with the knowledge and competence to fully operate the Vessel and the Operational Systems onboard the Vessel during normal routine operations, typhoon mooring, position keeping emergency operation process and emergency situations including fire-fighting and damage control. Throughout the training, the position keeping shall be the essential subjects. On completion of the training course, the participants shall be capable to deliver further training courses to other HKPF officers.

11.4.2 Upon Delivery Acceptance, the Contractor shall then deliver this training course according to

the approved syllabus to HKPF operational staff as follow:

(a) Thirty (30) staff at the first (1st) Vessel Delivery (shall be separated into multiple classes as required by HKPF and GNC);

(b) Twenty-five (25) staff at the fourth (4th) Vessel Delivery; and

(c) Twenty-five (25) staff at the eleventh (11th) Vessel Delivery.

11.5 ENE Maintenance Training

11.5.1 The purpose of the ENE maintenance training course is to provide the COMMS technical and maintenance staff with a detailed knowledge of all aspects of the design considerations, operation, interconnected system operation, fault diagnosis, routine maintenance, trouble shooting and repair or replacement procedures of the equipment of the Vessel. This course shall provide the COMMS technical and maintenance staff with sufficient expertise to enable them to effectively maintain the equipment of the Vessel after the expiry of the Warranty Period. It shall include both practical demonstrations and tests.

11.5.2 Upon Delivery Acceptance, the Contractor shall then deliver this training course to HKPF staff as follow:

(a) Fifteen (15) staff at the first (1st), fourth (4th) and eleventh (11th) Vessel Delivery (shall be separated into multiple classes as required by HKPF and GNC)

11.6 Other Trainings

11.6.1 Other trainings to be provided by the Contractor shall include, but not be limited to, the following syllabus:

(a) a thorough knowledge of the operational limitations of the craft and of any operating restrictions imposed by HKMD;

(b) a thorough knowledge of the structure and layout of the vessel, including stability conditions, and bilge pumping arrangements;

(c) a working knowledge of the operation of the following systems:

(1) propulsion and associated systems;

(2) electrical system;

(3) fire protection system;

(4) navigation and communication systems;

(5) ship control systems both in displacement and non-displacement modes; and

(d) a thorough knowledge of the failure modes of the control, steering and propulsion systems and the proper response to such failures;

(e) a thorough knowledge of the significance of and correct response to alarms and caution indicators on all wheelhouse instrumentation;

(f) a practical handling test on the vessel to include all normal, abnormal, and emergency procedures in both displacement and non-displacement modes;

(g) a thorough knowledge of bridge procedures; and

(h) a thorough knowledge of the use of life-saving and fire-fighting appliances on board and the arrangements for mustering, evacuating passengers and crew members in the event of

an emergency.

11.6.2 Upon Delivery Acceptance, the Contractor shall then deliver this training course according to the approved syllabus to HKPF staff as follow:

(a) Thirty (30) staff at the first (1st) Vessel Delivery (shall be separated into multiple classes as required by HKPF and GNC);

(b) Twenty-five (25) staff at the fourth (4th) Vessel Delivery; and

(c) Twenty-five (25) staff at the eleventh (11th) Vessel Delivery.

Chapter 12 Abbreviations

3G	3rd Generation
4G	4th Generation
5G	5th Generation
A	Ampere
ABS	American Bureau of Shipping
AC	Alternating Current
AES	Advanced Encryption Standard
AFFF	Aqueous Film-Forming Foam
AIS	Automatic Identification System
AML	Additional Military Layers
ARCS	Admiralty Raster Chart Service
ARPA	Automatic Radar Plotting Aid
ASNT	American Society for Nondestructive Testing
ASTM	American Society for Testing and Materials
ASWF	American Standard Window Film
AV	Audio Video
AVLS	Automated Vehicle Location System
AWS	American Welding Society
BeiDou	BeiDou Navigation Satellite System
BNC	Bayonet Neill-Concelman
BS	British Standards
BSB	data encoded in the BSB format
BWA	Biological Warfare Agent
CBRN	Chemical, Biological, Radiological and Nuclear
CCD	Charge-Coupled Device
CCTV	Close Circuit Television
CD	Compact Disc
cd/ m^2	Candela per Square Metre
CD-ROM	Compact Disc Read-Only Memory
CFC	Chlorofluorocarbon
CFD	Computational Fluid Dynamics
CH	Channel
cm	Centimetre
FM200	heptafluoropropane
COG	Course Over Ground
COLREGs	International Regulations for Preventing Collisions at Sea

CPA	Closest Point of Approach
CPU	Central Processing Unit
CRT	Cathode Ray Tube
c/w	Come with
CWA	Chemical Warfare Agent
dB	Decibel
dB(A)	A-Weighted Decibel
dBi	Decibel Isotropic
dBm	Decibel-milliwatts
DC	Direct Current
DDR	Double Data Rate
deg	Degree
DGNSS	Differential Global Navigation Satellite System
DISS	DNC Digital Nautical Chart
DPDT	Double-Pole, Double-Throw
DSC	Digital Selective Calling
DTRS	Digital Trunk Radio System
DVD	Digital Versatile Disc
DVI	Digital Video Interface
DVR	Digital Video Recorder
ECDIS	Electronic Chart Display and Information System
ECS	Electronic Chart System
EFFS	External Fire-Fighting System
EFCP	External Fire-Fighting Control Panel
EGNOS	European Geostationary Navigation Overlay Service
EIAPP	Engine International Air Pollution Prevention
ENC	Electronic Navigational Charts
ENE	Electronic Navigation Equipment
EOSS	Electro Optical Sensor System
ETSI	European Telecommunications Standards Institute
FTP	Fire Test Procedures
FO	Fuel oil
FOV	Field of View
g	Gravity
Galileo	Europe's Global Navigation Satellite System (GNSS)
GB	Gigabyte
GeoTIFF	Format File

GHz	Gigahertz
GLONASS	Global Navigation Satellite System
GM	Metacentric Height
GMDSS	Global Maritime Distress Safety System
GMT	Greenwich Mean Time
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GRP	Glass-Reinforced Plastic
GZ	Righting Lever
HazMat	Hazardous Material
HEPA	High-Efficiency Particulate Arrestance
HCFC	Chlorodifluoromethane
HD	Hard Disk
HDD	Hard Disk Drive
HDMI	High Definition Multimedia Interface
HPS	Harbour Patrol Section
HSC	High-speed Craft
HVAC	Heating, Ventilation and Air Conditioning
Hz	Hertz
IALA	The International Association of Marine Aids to Navigation and Lighthouse Authorities
ICR	Infrared Cut Filter
IHO	International Hydrographic Organization
IMM	International Maritime Mobile
IMO	International Maritime Organisation
IEC	International Electrotechnical Commission
IP	Ingress Protection
IPsec	Internet Protocol Security
IPX	Internetwork Packet Exchange
IR	Infra-Red
IS	Intact Stability
IS CODE	International Code on Intact Stability
ISO	International Organization for Standardization
ITU-R	International Telecommunication Union – Radiocommunication Sector
K	Kilo
kΩ	Kilo Ohm
kg	Kilogram
kHz	Kilohertz

km	Kilometre
km/h	Kilometre per hour
kts	Knots
kW	Kilowatt
L/min	Litre per minute
LO	Lube Oil
LCD	Liquid Crystal Display
LCG	Longitudinal Centre of Gravity
LED	Light-Emitting Diode
L/s	Litre per second
LSA	Lifesaving Appliances
m	Metre
ms	Millisecond
m/min	Metre per minute
m/s	Metre per Second
m^3	Cubic Metre
M/E	Main Engines
MARPA	Mini-Automatic Radar Plotting Aid
MARSAS	Marine Situational Awareness System
MCR	Maximum Power
MCS	Monitoring and Control System
MEI	MEI Corporation
MFD	Multi-Function Display
MHz	Megahertz
MJ/ m^2	Megajoule per Square Metre
MKD	Minimum Keyboard Display
mm	Millimetre
mRad	Milliradian
MMC	Multi Media Card
MMSI	Maritime Mobile Service Identity
MOB	Man-Over-Board
MP3	MPEG-1 Audio Layer III or MPEG-2 Audio Layer III
mph	Mile per hour
MRCS	Marine Radio Communications Systems
MS PRO	Memory Stick PRO
MS PRO Duo	Memory Stick PRO Duo
MSC	Maritime Safety Committee

mK	milli-Kelvin
mV	Milli Voltage
NAVSEA	Naval Sea Systems Command
NDT	Non-Destructive Test
NETD	Noise Equivalent Temperature Difference
NIR	Non-Ionizing Radiation
NFPA	National Fire Protection Association
NMEA	National Marine Electronics Association
NOx	Nitrogen Oxides
ns	Nanosecond
NTRIP	Networked Transport of RTCM via Internet Protocol
NUC	Not Under Command
ohm	Unit of Electrical Resistance
OBE	On-Board Electronics
OC	Oleoresin Capsicum
OOW	Officer of the Watch
ONVIF	Open Network Video Interface Forum
OSHA	Occupational Safety and Health Administration
Pa	Pascal
PAL	Phase Alternating Line
p.s.i.	Pounds per square inch
PCB	Printed Circuit Board
PPTP	Point-to-Point Tunnelling Protocol
PTO	Power Take Off
PVC	Polyvinyl Chloride
QoS	Quality of Service
RAM	Random Access Memory
RCA	Radio Corporation of America
RGB	Red Green Blue
RF	Radio Frequency
RG58U	RG58U Type Coaxial Cable
RH	Relative Humidity
ROT	Rate Of Turn
rpm	revolutions per minute
RPM	revolutions per minute
RT	Radioactive Test
RTCM	Radio Technical Commission for Maritime Services

SATA	Serial Advanced Technology Attachment
SBAS	Satellite-Based Augmentation Systems
SD	Secure Digital
SENC	System Electronic Navigation Chart
SINAD	Signal-to-noise and Distortion Ratio
SOG	speed over ground
SOLAS	Safety of Life at Sea
SPL	Sound Pressure Level
SSD	Solid-State Drive
STANAG	NATO Standardization Agreement
SWL	Safe Working Load
TBT	Tributyltin
TCG	Transverse Centre of Gravity
TCPA	Time of Closest Point of Approach
TFT	Thin-Film Transistor
TI	Thermal Imaging
TIFF	Tagged Image File Format
TMR	TOPEX/Poseidon Microwave Radiometer
TS	Technical Specifications
UHF	Ultra High Frequency
UPS	Uninterruptible Power Supply
USB	Universal Serial Bus
UTC	Universal Time Coordinated
UV	UltraViolet
V	Volt
VAC	Voltage of Alternating Current
VCG	Vertical Centre of Gravity
VDC	Voltage of Direct Current
VDR	Voyage Data Recorder
VFD	Variable Frequency Drive
VGA	Video Graphics Array
VHF	Very High Frequency
VMAP	Vector Map
VoIP	Voice Over Internet Protocol
VPN	Virtual Private Network
VSWR	Voltage Standing Wave Ratio
VTC	Vessel Traffic Centre

VTS	Vessel Traffic Services
W	Watt
WAN	Wide Area Network
WAV	Waveform Audio File Format
WMS	Web Map Service

Part VII - Annex 1 - Warranty Services and Guarantee Slipping

1. Warranty Services

1.1. The Contractor shall provide Warranty Services in relation to all aspects of the Vessel during the Warranty Period, including Guarantee Slipping as stipulated in this Annex. Both the Warranty Services and Guarantee Slipping shall be carried out locally in Hong Kong. If the Contractor appoints a local sub-contractor to perform the Warranty Services (hereinafter "local agent"), the Contractor shall ensure that the local agent appointed will perform the Warranty Services and Guarantee Slipping in full compliance with the requirements of the Contract including those as set out in this Annex 1. It must be emphasized that it is the Contractor's responsibility to ensure the Warranty Services and Guarantee Slipping are performed in full compliance with the terms of the Contract. The Contractor shall arrange their own technical staff with all the necessary skills, qualifications and experiences to conduct the services. Unless the technical staff from the local agent meet all these requirements, the technical staff from the local agent shall not provide the required Warranty Services but those technical staff from the Contractor to travel to Hong Kong for providing the Warranty Services. The Contractor shall provide the curriculum vitae of the local agent's engineers involved in providing the Warranty Services as part of the Deliverables to be provided as part of the Delivery Acceptance. The Government reserve the rights to reject any engineer whose qualification and experience are not acceptable to GNC and the Government reserves the right not to accept the Vessel.

1.2. The Government reserves all rights and claims against the Contractor in the event that any warranty claim has not been handled in accordance with the terms of the Contract including this Annex and the Detailed Procedures as mentioned in Paragraph 1.6 below. Furthermore, even it is agreed between the Government and the Contract after the necessary joint inspection and investigation that certain damage to the Vessel or any part thereof falls outside the scope of the Warranty Services, if so requested by the Government, the Contractor and its local agent shall still be responsible for the repair of such damage on the same terms as set out in this Annex 1 except that it shall be at the cost of the Government. Should the Contractor and its local agent refuse to do so or provide an unreasonable quotation of the repair cost, without prejudice to the rights and claims against them, the Government shall have the full right to appoint another contractor for the repair, and the Contractor agrees that the Warranty Period and the Warranty Services for the relevant Warranty Item(s) shall not be violated or affected notwithstanding such appointment.

1.3. For the Equipment in respect of which the manufacturer/supplier does not offer a one-year free warranty on such equipment, the Contractor shall provide the Warranty Services throughout the Warranty Period at the Contractor's own cost. For other loose equipment and installations, such as life-saving and firefighting equipment, etc., which are required to be serviced, inspected or renewed annually, the Contractor shall provide the servicing, inspection and renewal as per the manufacturer's requirements of that equipment or installation throughout the Warranty Period applicable to such items.

1.4. During the Warranty Period, when the Vessel or any part thereof is handed over for the Warranty Services and/or Guarantee Slipping, the Contractor shall be responsible for the collection and due return of the Vessel in good order (including all freight from and to the Government Dockyard and insurance (as further mentioned below)). Should there be any loss or damage of the Vessel or any Warranty Item (as defined in Paragraph 1.5 below) caused by any reason whatsoever while the Vessel is in the possession or control of the Contractor (including even when the Vessel is at the Government Dockyard or a maintenance base of the user department) or at the shipyard of the Contractor or an authorised agent appointed by it, the Contractor shall pay for the cost for the loss or damage plus 20% as and for liquidated damages but not as a penalty. Throughout the Warranty Period, notwithstanding anything to the contrary in the Contract, the Vessel and all Warranty Items are deemed to be at the Contractor's risks, and the Contractor shall insure and keep insured, at his own expense, a property insurance with the Government to be named as the sole payee, for an indemnity amount of not less than the purchase price of the Vessel plus 20% to protect the Government property against all risks. The Certificate of Insurance and evidence showing that the premium has been paid shall be available for inspection in advance. The Contractor shall provide this insurance policy before the commencement of the Warranty Services and/or Guarantee Slipping. Any excess payable under the insurance policy shall be borne by the Contractor.

1.5. Total Vessel Warranty

It is required that the Vessel is covered by the free of charge Warranty Services for one (1) year after the date of the issue of the unqualified Acceptance Certificate in respect of the Vessel. If there is more than one (1) Vessel, each such Vessel shall be covered in the aforesaid manner. The Warranty Services shall cover the entire Vessel and all its Equipment (including without limitation all Equipment specified in Schedules 6 and 7 in Part V and all Electronic Navigational Equipment as defined in relevant chapter(s) of Part VII), fittings and outfit and all Spare Parts (collectively, "Warranty Items") against defects in design, construction, workmanship or materials and against any non-compliance with any of the Product Warranties. The Warranty Services may be backed up by the Contractor using individual equipment suppliers/manufacturers' warranties but the Contractor shall remain solely liable to MD as a primary obligor to provide the Warranty Services regardless of the terms of the warranty including duration provided by such suppliers or manufacturers. Notwithstanding and without prejudice to the Contract on warranty obligations for the total Vessel, any individual equipment supplier/manufacturer's warranty extending beyond the one-year total Vessel warranty must be assigned to the Government as appropriate. In order not to violate the warranty of the engine(s), gearbox(es), propulsion system(s) and other major equipment, the Contractor shall also provide the corresponding periodic maintenance services based on the manufacturer(s)' manuals and recommendations within the Warranty Period at no extra cost to the Government.

1.6. Procedures for Warranty Claim

Without prejudice to the provisions of the Contract, detailed procedures for dealing with warranty claims must be proposed by the Contractor and agreed by MD before the issuance of the unqualified Acceptance Certificate of the Vessel ("Detailed Procedures"). These Detailed Procedures shall be agreed based on the following principles:

1.6.1. Any notification of claimed defect shall be sent from MD to the Contractor through a defined route.

1.6.2. There shall be a joint inspection and investigation to examine the defect and the Contractor shall propose the appropriate and necessary remedial action to the satisfaction of the Director.

1.6.3. The Contractor shall undertake on-site Warranty Services (including provision of all replacement Warranty Items, spare parts, labour, materials, test equipment, lifting, docking, and transportation) whether, at the option of the Government, the Vessel is berthed at the local agent's shipyard or in the Government Dockyard or maintenance bases of the user department. Taking the Vessel back to the shipyard of the Contractor (place of construction) should be avoided unless absolutely necessary.

1.6.4. Rectification of defects must have a minimum effect on the operation of the Vessel by the provision of on loan equipment if the anticipated repair time exceeds the time frame as specified in Paragraph 1.7.1 below. The proposed manner of the rectification must first be approved by the Government.

1.7. Throughout the Warranty Period, the Contractor shall be responsible for the provision of free of charge corrective maintenance and rectification of all defects in all and any of the Warranty Items including repair and replacement as necessary. This shall, at no cost to the Government, include Warranty Services to be performed by the Contractor described in the following sub-paragraphs:

1.7.1. To attend to the Vessel for inspection and repair within twenty-four (24) hours (excluding Hong Kong public holidays) of receiving the report of a fault ("fault report") and to take immediate action to rectify the defect after inspection. Unless otherwise agreed by the Government, all corrective maintenance and rectification must be effected within forty-eight (48) hours after the fault report is first issued. The MD must be informed of what corrective maintenance and rectification actions have been taken within seventy-two (72) hours of receiving the relevant fault report.

1.7.2. To provide all necessary transport, replacement Equipment, spare parts, labour and materials, tools and testing instruments required for the corrective maintenance and rectification.

1.7.3. Any replacement item or part to be deployed shall originate from the Warranty Spare Parts or otherwise from the manufacturer of the original Warranty Item to be repaired of the same model and with the same or better specifications and must be able to be found in the latest

spare parts list issued by such manufacturer. Alternative components shall not be used without the prior approval in writing of the MD.

1.7.4. If the Contractor fails to respond to any reported warranty claims within forty-eight (48) hours, the MD may arrange corrective maintenance and rectification of the defect either on its own or by deploying a third-party contractor as deemed appropriate with a view to minimising any downtime incurred. In such case, the Contractor shall compensate the Government for the full cost of such repairs plus 10% as and for liquidated damages but not as a penalty no later than ten (10) working days after a written demand has been served on the Contractor by MD. **Any such corrective maintenance and rectification of the defect completed by MD on its own or by another third-party contractor shall not relieve the Contractor from its obligations under the Contract including those in respect of the remainder part of the Warranty Period (including all extensions). The Warranty Period shall not be affected or broken due to such course of action.**

1.8. Extension of Warranty

1.8.1. The Warranty Period for any Warranty Item shall be extended for such duration whilst the Contractor has failed to repair and correct satisfactorily the defects in such Warranty Item exceeding seven (7) working days counting from the date when the relevant fault report was first issued (or otherwise exceeding such longer permissible repair duration of more than seven (7) working days as the Government considers appropriate depending on the warranty claim) (and depending whichever is applicable, this is the "permissible repair time").

1.8.2. Warranty Items which are replaced during the Warranty Period shall have a new warranty period of one (1) year commencing from the date of replacement including the replacement as mentioned in Paragraph 1.9 below.

1.8.3. Equipment which is found to be defective during the trials at the Guarantee Slipping as mentioned in Paragraph 2.2.5 below shall have an extension of warranty of one (1) year.

1.8.4. The Warranty Period of the Vessel shall be extended if the entire Vessel is out of service for more than twenty-four (24) hours in excess of the permissible repair time as mentioned in paragraph 1.8.1 above due to any failure in any Warranty Item and this extension will count from the date when the relevant fault report was first issued until the rectification of such fault. For the avoidance of doubt, this paragraph 1.8.4 shall apply if due to any failure the Vessel has to be put out of service. It is only if the Vessel would not be put out of service notwithstanding any failure that there shall only be extension of the relevant Warranty Item but not the entire Vessel under paragraph 1.8.1.

1.8.5. In relation to a Warranty Item with extended Warranty Period as mentioned in Paragraph 1.8.1 and/or 1.8.2 and/or 1.8.3 and/or 1.8.4 above, depending on whichever is applicable, all references to Warranty Period in the Contract shall be construed to include such extended Warranty Period. For the avoidance of doubt, in the case of paragraph 1.8.4 above, the entire Vessel and all Warranty Items installed therein shall be given an extended Warranty Period in accordance with that paragraph.

1.9. Recurrent Defects

During the Warranty Period, should a second and similar defect arise in relation to a Warranty Item, this shall be construed as conclusive evidence of the Warranty Item's unsuitability for the purpose intended, and the Contractor shall take immediate steps to conduct a thorough investigation jointly with MD at the Contractor's expense, to ascertain the reasons for any such defect and shall forthwith at the MD's option and the Contractor's expense, procure and deliver another replacement Warranty Item with a new design suitable for the purpose intended to replace the original defective Warranty Item.

1.10. In the event that the Contractor proposes to modify any Warranty Item or any part of the Vessel in order to repair or replace the same or another Warranty Item, the Contractor shall obtain the Government's advance written consent to the proposed modification.

1.11. Throughout the Warranty Period, the Contractor shall in respect of the first Vessel to be delivered maintain an inventory of spare parts, which shall be brand new items fresh from the factory serving as spare parts of the items as listed in Schedules 6 and 7 in Part V (and complying with the same Overall Specifications as applicable to these items) and in the quantity as found in one Vessel with its local agent in Hong Kong which the Contractor shall use for performing the Warranty Services (viz., Warranty Spare Parts). The Government will not provide its own inventory of the Spare Parts to the Contractor for the provision of the Warranty Services.

1.12. Updated/Upgraded Information

It is expected that during the Warranty Period certain Warranty Items may be modified or changed. All documentation affected by this change must be updated to reflect the new situation. All the support documentation such as the Vessel inventory list, job information and maintenance scheduling in relation to these modifications and changes shall be provided at the expiry of the Warranty Period.

1.13. Warranty of Electronic Navigational Equipment

On top of the Warranty Services described in this Annex 1, there are also service specifications of the Warranty Services set out in relevant chapter(s) of this Part VII for the Electronic Navigational Equipment. In the event of any inconsistency, the better service specifications shall prevail. Please refer to the relevant chapter(s) of this Part VII.

2. Guarantee Slipping

2.1. As stated in the section "Warranty" above, Guarantee Slipping shall be carried out at the end of the original Warranty Period (but if there is any extension of the Warranty Period for the entire Vessel, GNC has right to decide if the time of Guarantee Slipping should be upon the expiry of the original Warranty Period before any extension or upon the expiry of the extended Warranty Period).

2.2. At the Guarantee Slipping, the Contractor shall carry out the following work and provide all necessary materials, spare parts, labour and equipment in order to carry out such work:

2.2.1. Pre-guarantee slipping inspection and trial

(a) Joint inspection with trial to confirm the list of guarantee slipping items; and
(b) Collect vessel performance information beforehand for comparing when guarantee slipping completion.

2.2.2. Engines and Gearboxes

(c) Renew the lubricating oil and replace the filters for the outboard engines and gearboxes and top up the engine coolant (if applicable) as per the manufacturer's recommendations;
(d) Clean all the engine air filters and change the filter elements;
(e) Change all fuel/water separators elements and fuel filters for all engines;
(f) Flush through the cooling system of the outboard engines and gearboxes and renew all zinc anodes if provided;
(g) Check all the engines' belts and adjust or renew if necessary;
(h) Check tappet clearances for the inlet and exhaust valves, ignition timing and idle speed and adjust if necessary;
(i) Conduct function tests for the engines' protection system and their associated sensors, gauges and other measuring devices;
(j) Disconnect and remove all engines and gearboxes sea water pipes (suction & discharge) for inspection, and clear off marine growth and obstructive materials in all pipes and fittings;
(k) Repair all damages and leakages in the pipelines; and
(l) Any other work required or recommended by the engine manufacturer.

All of the work listed at Paragraphs 2.2.2(a) to (i) shall be carried out by the manufacturer's authorised agent/dealer. All the work procedures and the spare parts used shall comply with the manufacturer's specifications and requirements.

2.2.3. Hull and Deck Items (where applicable):

(a) Paint Under the Water Line

(i) Paint under the water line shall be checked by the paint manufacturer's representative for the effectiveness of one (1) year's protection against marine growth;
(ii) The hull shall be cleaned and ready for inspection of paint damage;
(iii) Damaged paint shall be repaired according to the paint/gelcoat manufacturer's procedures;
(iv) After the repair of the damaged paint as specified at Paragraph 2.2.3(a)(iii) above, two coats of touch up primer and one (1) coat of touch up shall be applied; and
(v) One touch up anti-fouling paint of finishing coat shall be applied to the damaged paint as specified at Paragraph 2.2.3(a)(iii) above.

(b) Paint Above the Water Line

(i) Damaged paint on the hull above the water line and deckhouse shall be repaired properly. After repair, two (2) coats of touch up primer and one coat of touch up (finishing) shall be applied;

(ii) Two (2) coats of paint shall be applied on the Vessel's name, draft marks and insignia; and
(iii) One (1) full coat of anti-slip paint shall be applied to the open and side deck.

(c) Inspect, clean and polish propellers/waterjet impellers;
(d) Inspect, clean and remove obstructed object on the propulsion shaft;
(e) Free, clean, grease and recondition all moving parts of the deck fittings, i.e. WT (water tight) hatches, vent covers, rollers and fairleads and anchor chain stoppers, etc;
(f) Renew all zinc anodes;
(g) Life-saving appliances ("LSA") and Fire-fighting appliances ("FFA") must be serviced and re-certified as required. (Free, clean, grease and recondition all fire control valves, hydrants and bilge suction and control valves);
(h) Free, clean and repaint the anchor chain and swivel set;
(i) Remove the fuel tank(s) from the fuel tank compartment(s). all fuel tanks shall be pressure-tested free of leakage, while the hull structures in the fuel tank compartment should inspected correct; and
(j) In order to facilitate GNC/HKPF officers carrying out any inspections (if any found necessary) inside the under-deck compartments (including but not limited to visual inspections, non-destructive tests to the welding beams, etc), open up all the compartment hatches & inspection doors and remove the fuel oil tank(s) from vessel. Prepare and obtain a gas free certificate issued by approved person according to local regulation. Restore the fuel system afterward.

2.2.4. Mechanical & Electrical

(a) Dismantle all overboard valves for inspection and renew the defective parts;
(b) Check and clean the sea water system (including the grating, sea chest internal, sea suction and strainers) complete with renew their zinc anodes;
(c) Each of the compartment bilge suction to be checked and free of rubbish;
(d) Generator megger test and electrical circuit earth leak test;
(e) Electric cables and pipes penetration inspection; and
(f) Batteries condition check and switch over test.

2.2.5. The following shall be tested at the dock trial / sea trials as part of the Guarantee Slipping:

(a) Engine control and steering system including emergency/alternative method;
(b) Engine alarm and shut down function (including emergency stopping of engines at wheelhouse);
(c) Functional test of fuel supply emergency shutdown devices;
(d) Navigational equipment, lights and sound signals;
(e) Ahead and astern running and crash stop test;
(f) Steering trial;
(g) Speed measurement;
(h) Bilge system function (including high level bilge alarm system);
(i) Fire pump(s) function (including fire detection system, alarms, ventilation fans /fuel pump remote shutdown);
(j) Other trials or testing of equipment as required by the Government Representative;
(k) Any item or component found defective shall be repaired or replaced;
(l) The Dock Trial and Sea Trial Safety Checklist items, as listed below:

Dock Trial Check List

General items will be checked during dock trial

1.	Engines start and stop testing
2.	Engines emergency stop check
3.	Engines speed and clutch unit testing
4.	Engines speed high and low idle speed testing
5.	Engines gauges and alarm check
6.	Propulsion system testing
7.	Anchor testing
8.	Navigation lights testing
9.	Vessel horn testing and windows screen wipers testing
10.	Fire protection system check
11.	Portable fire extinguishers inspection
12.	Life-saving equipment inspection
13.	Signal and light testing
14.	Engine room ventilation fans testing
15.	Air handling unit and air conditioning system testing
16.	A/C cooling water pumps testing
17.	Bilge system in each compartment testing.
18.	Floor plate inspection
19.	Cabin lights testing
20.	Fuel tanks quick closing valves testing
21.	G.S. pumps testing
22.	Fire pumps testing
23.	Tailshaft cooling water pumps testing (if applicable)
24.	Bilge pumps testing
25.	Fuel oil pumps testing
26.	Waste water pumps testing
27.	Steering system power assisted and manual operation testing
28.	Emergency steering operation check
29.	Sanitary pumps testing
30.	Sewage pumps testing
31.	Fresh water pumps testing

Sea Trial Safety Check List

General items will be checked during sea trial	
1.	Engines start and stop testing
2.	Engines emergency stop check
3.	Engines speed and clutch unit testing
4.	Vessel horn testing and windows screen wipers testing
5.	Portable fire extinguishers are in place
6.	Life jackets and life buoys are in place
7.	Sea trial navigation flag hoisted
8.	Telecommunication system function check
9.	Approved coxswains are in control
10.	Sufficient fuel oil to perform the full course of sea trial

(m) Other trials or testing of equipment as required by the Government Representative; and

(n) Any item or component found defective shall be repaired or replaced.

2.3. After Guarantee Slipping, the Contractor shall submit the above works completion report (including engines trial/testing report completed with engines parameters) to the Government Representative.

Part VII - Annex 2 - Implementation Timetable

Item No.	Milestone	Completion Date
1	Issuance of "Notification of Conditional Acceptance"	To be advised after Tender Evaluation
2	Contract Date (the date of the Contract appearing at the top of the Articles of Agreement)	The date when the last party signs the Articles of Agreement. The Government will not sign the Articles of Agreement until and unless the Contractor fulfils all of the conditions precedent as specified in Clause 25.2 of Part II - Conditions of Tender (save to the extent waived by the Government, if any).
3.	The Contractor shall submit the following in accordance with Clauses 11.1 and 11.2 of Part IV (a) An Implementation Timetable, in the form set out in Annex 2 to the TS, setting out the major milestones and their scheduled completion dates and incorporating the Delivery Dates specified in Schedule 2 of Part V; (b) The Drawing Submission Timetable in the form set out in Annex 3 to the TS; and (c) The Main Items Inspection Timetable in the form set out in Annex 4 to the TS.	Within fourteen (14) days from the Contract Date
4	Kick-Off Meeting	To be held within three (3) months after the Contract Date at the Government Dockyard or the Contractor's Shipyard to be determined by the Government
5	Submission of all drawings as listed in Annex 3 to Part VII	Two (2) months from the Contract Date
6	Completion of design with RO’s approval and GNC approval	
7	Completion of hull and superstructure of the Vessel	The Contractor shall propose the completion dates of Milestones **[7] to [16]** for each of the five batches of Vessels as specified in Schedule 2 of Part V for GNC's approval.

8	Completion of installation of engine propulsion system, waterjets and steering system	
9	Completion of installation of ENE	
10	Launching of the Vessel	
11	Conduct of all tests, inspections and trials as part of Stage 1 of the Technical Acceptance as described in paragraph 1.8.1 of Part VII	
12	Shipment to Hong Kong	
13	Conduct of all tests, inspections and trials as part of Stage 2 of the Technical Acceptance to be performed in Hong Kong Waters as described in paragraph 1.8.2 of Part VII	
14	Conduct of all tests, inspections and trials as part of Stage 3 of the Technical Acceptance to be performed in Hong Kong Waters as described in paragraph 1.8.3 of Part VII	
16	The date when the Vessel shall be Ready for Use	

Part VII - Annex 3 - Drawing Submission Timetable

Item No.	Drawings Approval	Completion Date
1	General Arrangement Plan and a 3D computer model of the Vessel interior for review	*All the drawings are required to be submitted in two (2) months after the Contract Date for GNC's approval/ reference.*
2	Lines Plan	
3	Stability Analysis & Calculations	
4	Inclining Experiment Report	
5	Typhoon Mooring Arrangement	
6	Structural Construction Plan in Mid-Ship and Bulkhead Section	
7	Construction Profile and Deck Plan	
8	Shell Expansion Plan	
9	Stem Construction and Stern Construction Plan	
10	Deckhouse Construction Plan	
11	Fuel Oil tank Construction	
12	Paint Schedule	
13	Tank Capacity Plan	
14	Engine Mounting Arrangement	
15	Power / Speed Estimation and Curve	
16	Intact and Damaged Stability Plan	
17	Details of Operational Systems	
18	Details of interfaces provisions of the Operational Systems for the HKPF supplied radio terminals, MARSAS and Satellite Communication System	
19	Details of Deck Equipment, Outfitting, Furniture, etc.	
20	Engine Room Arrangement	
21	Shaft line Arrangement	
22	Waterjet and Installation Drawings	
23	Steering Arrangement	
24	Details of Diesel Generator Arrangement	
25	Control Console Arrangement and Schematic Diagram	
26	Instrumentation and Control System	
27	Calculation of Fuel Capacity	
28	Details of Main Engines	
29	Details of Propulsion System - Main Engines, Reduction Gear Boxes, and the Waterjet Propulsion System	
30	Engine Room Piping Diagrams including sea water system, bilge system, fresh water system, black water system, HVAC	
31	Engine Room Ventilation and Exhaust	

Item No.	Drawings Approval	Completion Date
32	**Details of the Air-Conditioning System**	
33	**Details of Electrical and Electronic Equipment**	
34	**Electrical Load Calculations**	
35	**Schematic Layout of Electrical Circuits**	
36	**Lightning Protection Arrangement**	
37	**Details of Galvanic Corrosion Prevention**	
38	**Torsional Vibration Calculation**	
39	**Fire Fighting Arrangement**	
40	**Lifesaving Arrangement**	
41	**Safety Plan**	
42	**Tonnage Measurement Calculation**	
43	**Freeboard Calculation**	
44	**Fender Arrangement & Details**	
45	**Cathodic Protection Arrangement & Details**	
46	**Ship's Name & other Tally Plates Details**	
47	**Ship's Railing Arrangement & Details**	
48	**Wheelhouse Windows & Visibility Diagram**	
49	**Insulation & Lining Arrangement & Details**	
50	**Hatches & Manholes Arrangement & Details**	
51	**Anchoring & Mooring Arrangement**	
52	**Others as required**	

Note: All information to be submitted shall show compliance of the relevant Equipment or the Vessel or any part thereof with all requirements of the Contract.

Part VII - Annex 4 – Main Items Inspection Timetable

VESSEL NAME : "MEDIUM PATROL LAUNCHES"			Inspection date	Outstanding / Reinspection / Remarks
Item	Items to be inspected			
	Hull Structure, Layout and Outfitting Inspection			
H-1	Hull Lofting			
H-2	Construction materials – Aluminium plate mark checking for hull			
	a) Aluminium plate mark checking for hull			
	b) Material certification verification			
H-3	Construction materials – aluminium plate mark checking for deckhouse			
	a) Aluminium plate mark checking for deckhouse			
	b) Material certification verification			
H-4	Welding consumables and welders' certificates verification			
H-5	Keel lay inspection			
H-6	Fabrication of hull up to main deck in stages of work including			
	a) Alignment			
	b) Edge preparation			
	c) Welding			
	d) Workmanship			
	e) Compliance with approved plans			
	f) Non-destructive tests NDT (X-rays) of welds			
	g) Hull internal structural work inspection			
	h) Plating thickness gauging			
H-7	Engine girder fabrication and welding			
H-8	Deckhouse scantling and welding check			
H-9	Inspection and weld check of connection between deckhouse and main deck			
H-10	Welding construction and pressure test of tanks			
	Fuel oil tank(s)			
	a) Tank construction (internal/external/fitting)			
	b) Tank pressure test			
	Fresh water tank(s)			
	a) Tank construction (internal/external/fitting)			
	b) Tank pressure test			
	Black water tank			
	a) Tank construction (internal/external/fitting)			
	b) Tank seating construction/securing			
	c) Tank pressure test			
H-11	Hose test for hull and deckhouse			
H-12	Mock-up inspection for the wheelhouse			

H-13	Deckhouse console mock up			
H-14	Installation of the various outfitting items			
	a) Anchor and chain			
	b) Windlass			
	c) Hand pump			
	d) Hatches			
	e) Doors			
	f) Windows			
	g) Ventilators			
	h) Seating of heavy equipment and mast			
H-15	Function test of various outfitting items			
H-16	Water-tightness or weathertightness of openings			
	a) Manholes			
	b) Hatches			
	c) Doors			
	d) Windows			
	e) Ventilators and Air pipes			
	f) Cable glands			
H-17	Painting inspection of different layers			
H-18	Zinc anodes and lightning protection			
	a) Installation of zinc anodes b) Lightning protection			
H-19	Vessel dimension verification			
H-20	Draught marks verification			
H-21	Hull completion survey			
H-22	Arrangement of wheelhouse			
H-23	Inspection of fire, heat and sound insulation			
	a) Fire Insulation			
	b) Heat Insulation			
	c) Sound Insulation			
H-24	Interior furnishings			
	a) Wheelhouse b) Crew Space			
H-25	Lifesaving appliances and firefighting appliances			
	a) Lifesaving appliances			
	b) Firefighting appliances			
H-26	Inspection of sea chest and grating			
	a) Sea chest			
	b) Grating			
H-27	Inclining experiment			
H-28	Sea Trials including operation of outfitting			
H-29	Trial of Typhoon mooring arrangement			
H-30	Cleanliness inspection before acceptance			
H-31	Inventory check in HKSAR			

H-32	Acceptance and delivery			
H-33	Acceptance of As-Fitted drawings and Engine/Equipment manuals and Documentation			

VESSEL NAME : "MEDIUM PATROL LAUNCHES"			Inspection date	Outstanding / Reinspection / Remarks
Item	Items to be inspected			
	Machinery and Electrical Installation			
EM-1	General inspection and function tests on installation of machinery:			
	a) General inspection of the main propulsion engines			
	b) General inspection of the generator sets			
	c) General inspection of the shafting			
	d) General inspection of waterjet propulsion system			
EM-2	Main Engines:			
	a) Test of engine safety devices and alarms			
	b) Test of emergency stop			
	c) Inspection of exhaust pipe before lagging			
EM-3	Hydraulic test of sea water valve			
EM-4	Inspection of the sea water suction strainers			
EM-5	Fresh water system:			
	a) General inspection and dimension checking of the fresh water system			
	b) Fresh water tank low level alarm test			
	c) Fresh water tank final cleaning/internal inspection before filling			
	d) Fresh water tank high level alarm test			
	e) Fresh water tank content gauge calibration and test			
	f) Inspection of piping penetration of bulkhead and deck			
	g) Hydraulic test of fresh water system piping			
	h) Functional test of fresh water system			
EM-6	Fuel oil system:			
	a) General inspection and dimension checking of the fuel oil system			
	b) Fuel oil tank(s) low level alarm test			
	c) Fuel oil tank(s) final cleaning/internal inspection before filling			
	d) Fuel oil tank(s) high level alarm test			
	e) Fuel oil tank(s) content gauge calibration and test			
	f) Inspection of piping penetration of bulkhead and deck			
	g) Hydraulic test of oil fuel system piping			
	h) Functional test of oil fuel system i) Functional test of Quick closing valves j) Functional test of fuel tank stripping			
EM-7	Bilge system:			

	a) General inspection and dimension checking of the bilge system			
	b) Bilge tank high level alarm test			
	c) Bilge tank content gauge calibration and test			
	d) Inspection of piping penetration of bulkhead and deck			
	e) Hydraulic test of bilge system piping			
	f) Functional test of bilge system g) Functional test of unmanned bilge alarm			
EM-8	Black water/sanitary system:			
	a) General inspection and dimension checking of the black water/sanitary system			
	b) Inspection of piping penetration of bulkhead and deck			
	c) Hydraulic test of black water/sanitary system piping			
	d) Functional test of black water/sanitary system			
EM-9	Fire extinguishing systems:			
	a) General inspection and dimension checking of the fire extinguishing system			
	b) Inspection of piping penetration of bulkhead and deck			
	c) Hydraulic test of fire extinguishing system piping			
	d) Functional test of fire extinguishing system (internal and external)			
	e) Test of fixed fire extinguishing alarm system			
	f) Test of fire detection (e.g. smoke and heat detection) alarm system g) Functional test of unmanned fire alarm			
EM-10	Hydraulic test of sea water valve			
EM-11	Hydraulic system:			
	a) General inspection and dimension checking of the hydraulic system			
	b) Inspection of piping penetration of bulkhead and deck			
	c) Hydraulic test of hydraulic system piping			
	d) Functional test of hydraulic system			
EM-12	Engine room ventilation:			
	a) Inspection of E/R ventilation fan installation			
	b) Function test of start/stop at remote and local control for E/R ventilation fans c) Functional test of the fire dampers			
EM-13	Air conditioning system:			
	a) General inspection and dimension checking of the air conditioning system			
	b) Inspection and test of cooling water system			
	c) Functional test of air conditioning system			
	d) Full test of air conditioning during sea trial			
EM-14	Batteries:			
	a) Inspection and dimension checking of the batteries spaces including ventilation.			
	b) Inspection of battery connectors and battery boxes			
	c) Inspection of battery charger			

	d) Operational test of battery charger			
	e) Test of main engines and generators consecutive starting by each group of battery (start/stop at remote and local control)			
EM-15	Electrical installation:			
	a) Inspection of lightning protection			
	b) General inspection of cable layout and checking of cable sizes			
	c) Inspection of cable penetration of bulkhead and deck			
	d) Inspection of transformers			
	e) Inspection of tally plates			
EM-16	Main and emergency switchboard and panels:			
	a) Main switchboard and panels – high voltage primary injection test			
	b) Cable size checking of electrical switchboard installations			
	c) Inspection of AC distribution panel			
	d) Inspection of DC distribution panel			
	e) Megger test of the electrical system			
	f) Earth test of the electrical system			
EM-17	Control console(s):			
	a) Inspection of wheelhouse control console and wheelhouse remote engine control console			
	b) Functional test of wheelhouse console controls and remote console controls			
	c) Inspection of navigation equipment control panel			
EM-18	Lighting:			
	a) Inspection and functional test of general lighting			
	b) Inspection and functional test of emergency lighting			
	c) Inspection and functional test of floodlight installation			
	d) Inspection and functional test of searchlight installation			
EM-19	Navigation Lights and Signals:			
	a) Inspection and functional test of navigation lights			
	b) Test of horn /whistle			
EM-20	FMEA Report			
EM-21	Electronic Navigational Equipment installation and testing by COMMS			
EM-22	Firefighting system insulation and testing			
EM-23	Test of window wipers			
EM-24	Test of noise levels throughout the vessel during the sea trial			
EM-25	Inclining Experiment			
	a) Official Speed Trial			
	b) Other Official Sea Trials			
	Operational System			
OS-1	Installation inspection and functional test for Operational Systems			
OS-2	Inspection of tally plate and cable label			

OS-3	Inspection of space, cables and power reservation for other HKPF provided equipment e.g. MARSAS, radio terminals and others.			
OS-4	Function and performance test during Sea Trial			

Part VII - Annex 5 – Vessel Condition During Respective Sea Trial

1) Official Speed Trial

Conditions at Speed-Trial		
1	Person on board	5 Persons (at 92.5 kg per person including effect)
2	Fuel oil tanks	not less than 50% fuel tank capacity
3	Fresh water tank	not less than 50% tank capacity
4	Store/Utilities	0 kg
5	Sea Conditions	Sea state 0-2 : wave height 0.1 - 0.5 metres

2) Endurance and Performance Test

Conditions at Endurance and Performance Test		
1	Person on board	5 Persons (at 92.5 kg per person including effect)
2	Fuel oil tanks	not less than 80% fuel tank capacity
3	Fresh water tank	not less than 80% tank capacity
4	Store/Utilities	500kg
5	Sea Conditions	Sea state 0-2 : wave height 0.1 - 0.5 metres

3) Manoeuvrability Test

Conditions at Forward Turning Circle Test		
1	Person on board	5 Persons (at 92.5 kg per person including effect)
2	Fuel oil tanks	not less than 80% fuel tank capacity
3	Fresh water tank	not less than 80% tank capacity
4	Store/Utilities	500 kg
5	Sea Conditions	Sea state 0-2 : wave height 0.1 - 0.5 metres

4) Crash Stop Test / Astern Running Test / Emergency Steering Test

Conditions at Crash Stop Test / Astern Running Test / Emergency Steering Test		
1	Person on board	5 Persons (at 92.5 kg per person including effect)
2	Fuel oil tanks	not less than 80% fuel tank capacity
3	Fresh water tank	not less than 80% tank capacity
4	Store/Utilities	500 kg
5	Sea Conditions	Sea state 0-2 : wave height 0.1 - 0.5 metres

Part VII - Annex 6 – Endurance and Performance Tests

Date of Test:		Place of Test:	
Vessel's Identification:		Vessel's Name:	

Conditions at Endurance and Performance Test			
Person On board	**5**	Dummy Weight	**20 kg**
Fuel (Petrol)	**90%**	Other Equipment	**100 kg**
Sea Conditions			

Engines:	**Port Side**	**Center^**	**Starboard Side**	**Propellers:**	**Port Side**	**Center^**	**Starboard Side**
Maker				Maker			
Type				Type			
Serial Number				Diameter			
Rated Power				Pitch			
Rated Speed				Direction of Rotation			

Engine Load	**Engine Speed (rpm)**	**Vessel Speed (Knots)**	**Time (Start)**	**Time (Finish)**	Fuel Consumption (litres/minutes)	Engine Oil Pressure (Bar)	Engine (in) CW Temp. (ºC)	Others	Others
__% of MCR#	At Minimum Crushing Speed		10 min						
50% of MCR/rpm			5 min						
60% of MCR/rpm			5 min						
70% of MCR/rpm			10 min						
80% of MCR/rpm			10 min						
90% of MCR/rpm			10 min						
95% of MCR (Endurance Test)			120 min						
		Remarks:							

Witness by:	MD Representative	Shipyard Representative

^Notes: Apply to the third engine if applicable.
#Notes: All references to MCR or Maximum Power shall have the meaning given in Paragraph 1 of Part IV

Part VII - Annex 7 – As-Fitted Drawings and Documents

As-Fitted Drawings and Machinery/Equipment documents and information literature to be delivered to the Government after Delivery Acceptance

1. As-Fitted Drawings

1.1 At not less than four (4) weeks before the delivery of the Vessel, the Contractor shall deliver to the Government four (4) hard copies and two (2) soft-copies in .pdf and .dwg (where applicable) files of the following plans and drawings that contain the technical information of the Vessel and its machinery and equipment as they are when the Vessel is on the day accepted by the MD. These are termed the final version of the "As-Fitted" Plans and Drawings, and they must consist of the following ones as well as any other additional ones that may be required by GNC/MD during the design and construction of the Vessel and before the Vessel is accepted by the Government.

1.2 The As–Fitted Plans and Drawings shall be prepared by professional ship draughtsmen and they shall be prepared in a professional manner, scale, size and style normally required of in the ship design and construction business sector. All plans and drawings shall show and be clearly marked for the profile, plan, and section views of the layout, arrangement details, and construction details in a manner required by GNC officer.

1.2.1 General Arrangement Plan.

1.2.2 Lines plan and offsets data and table.

1.2.3 Stability information booklet and the inclining experiment report.

1.2.4 Hydrostatics, cross curves and intact and damage stability calculations for all ship loading conditions specified in the Technical Specifications.

1.2.5 Vessel subdivision drawings and stability calculations.

1.2.6 Painting scheme of the whole Vessel.

1.2.7 Vessel draught marking diagram.

1.2.8 Detailed arrangement and layout plan of the deckhouse, accommodation, decks showing the disposition of all main equipment, fittings and fixtures, furniture, doors, windows, hatches, manholes and access openings. The down-flooding openings (points) shall be clearing indicated on the drawings.

1.2.9 Equipment layout diagram.

1.2.10 Hull structural construction and hull scantlings drawings.

1.2.11 Hull shell and frames and the framings arrangement and construction plan.

1.2.12 Hull shell expansion plan.

1.2.13 Midship section plan

1.2.14 Profile and Deck construction plan.

1.2.15 Steering system and steering arrangement diagrams.

1.2.16 Deckhouse and deck structural and construction plan.

1.2.17 Hull watertight bulkheads construction plan.

1.2.18 Deckhouse to deck connection detailed construction plan.

1.2.19 Deck edge details and construction plan, including detailed structural arrangement drawings of hull to deck connection.

1.2.20 Detailed cathodic corrosion prevention and arrangement plans and drawings for the Vessel throughout.

1.2.21 Mast structural and construction plan and mast equipment arrangement plan.

1.2.22 Anchoring arrangement plan.

1.2.23 Piping diagrams for fuel oil, freshwater, bilge, firefighting, scuppers and drains, sewage system.

1.2.24 Fire prevention, fire control and firefighting system drawings.

1.2.25 Drawings of the main switchboard and all other switchboards and the electrical system.

1.2.26 Electrical Load Calculation

1.2.27 Electrical installation drawings

1.2.28 Details of the Operational Systems

1.2.29 Operational Systems equipment installation and location drawings, including ENE, communications, radio terminal and MARSAS.

1.2.30 Operational Systems connection drawings

1.2.31 Wheelhouse and cabin sound and heat insulation system diagram.

1.2.32 Main engines and generator sets arrangement and siting plans and drawings of their fuel lines and exhaust gas piping and arrangement.

1.2.33 FMEA and test report.

1.2.34 Shaft line arrangement.

1.2.35 Waterjet details and drawings

1.2.36 Vessel ventilation drawings for the wheelhouse, accommodation and other spaces.

1.2.37 Main fuel oil tank drawing and its associated piping and manifold(s), and filling, overflow and ventilation system.

1.2.38 Freshwater tank and its associated piping arrangement.

1.2.39 Fuel oil tank(s) and its associated piping system

1.2.40 Black water tank and its associated piping system

1.2.41 Drawings for anchor, windlass and the anchoring system.

1.2.42 Lifesaving appliance arrangement plan and fire safety plan.

1.2.43 Distress signals, alarm systems, and internal/external communication arrangement and system plan.

1.2.44 Navigation lights, sound and signal diagrams.

1.2.45 Vessel overall lighting arrangement and light control plan.

1.2.46 Vessel alarm and signals, internal communication systems and public address systems plan.

1.2.47 General layout and arrangement drawing of the air-conditioning system.

1.2.48 Piping layout drawing of the air-conditioning system.

1.2.49 Air-conditioning load calculation.

The lists are not exhaustive, additional as-fitted drawings may be added if required.

1.3 Documents to be provided by the Contractor

1.3.1 In not less than one (1) month before the Delivery Acceptance of the Vessel, the Contractor shall provide for GNC's acceptance a list of all documents to be provided.

1.3.2 When the Vessel is delivered to the Government Dockyard, the Contractor shall deliver to the Government all the technical information, leaflets, literature, manuals and booklets, etc. and whatsoever items that are necessary for the operation, handling, services, maintenance, spare parts, repairs and the technical understanding of any one of all the engines, machinery, motors, pumps, equipment, fittings and outfitting items of the Vessel.

Part VII - Annex 8 – Definition of Waves and Sea

Beaufort scale number	Description	Wind speed	Wave height	Sea conditions	Land conditions
0	Calm	< 1 km/h (< 0.3 m/s) < 1 mph < 1 knot < 0.3 m/s	0 m 0 ft	Flat.	Calm. Smoke rises vertically.
1	Light air	1.1–5.5 km/h (0.3–2 m/s) 1–3 mph 1–3 knot 0.3–1.5 m/s	0–0.2 m 0–1 ft	Ripples without crests.	Smoke drift indicates wind direction. Leaves and wind vanes are stationary.
2	Light breeze	5.6–11 km/h (2–3 m/s) 4–7 mph 4–6 knot 1.6–3.4 m/s	0.2–0.5 m 1–2 ft	Small wavelets. Crests of glassy appearance, not breaking	Wind felt on exposed skin. Leaves rustle. Wind vanes begin to move.
3	Gentle breeze	12–19 km/h (3–5 m/s) 8–12 mph 7–10 knot 3.5–5.4 m/s	0.5–1 m 2–3.5 ft	Large wavelets. Crests begin to break; scattered whitecaps	Leaves and small twigs constantly moving, light flags extended.
4	Moderate breeze	20–28 km/h (6–8 m/s) 13–17 mph 11–16 knot 5.5–7.9 m/s	1–2 m 3.5–6 ft	Small waves with breaking crests. Fairly frequent whitecaps.	Dust and loose paper raised. Small branches begin to move.
5	Fresh breeze	29–38 km/h (8.1-10.6 m/s) 18–24 mph 17–21 knot 8.0–10.7 m/s	2–3 m 6–9 ft	Moderate waves of some length. Many whitecaps. Small amounts of spray.	Branches of a moderate size move. Small trees in leaf begin to sway.
6	Strong breeze	39–49 km/h (10.8-13.6 m/s) 25–30 mph 22–27 knot 10.8–13.8 m/s	3–4 m 9–13 ft	Long waves begin to form. White foam crests are very frequent. Some airborne spray is present.	Large branches in motion. Whistling heard in overhead wires. Umbrella use becomes difficult. Empty plastic bins tip over.
7	High wind, moderate gale, near gale	50–61 km/h (13.9-16.9 m/s) 31–38 mph 28–33 knot 13.9–17.1 m/s	4–5.5 m 13–19 ft	Sea heaps up. Some foam from breaking waves is blown into streaks along wind direction. Moderate amounts of airborne spray.	Whole trees in motion. Effort needed to walk against the wind.
8	Gale, fresh gale	62–74 km/h (17.2-20.6 m/s) 39–46 mph 34–40 knot 17.2–20.7 m/s	5.5–7.5 m 18–25 ft	Moderately high waves with breaking crests forming spindrift. Well-marked streaks of foam are blown along wind direction. Considerable airborne spray.	Some twigs broken from trees. Cars veer on road. Progress on foot is seriously impeded.
9	Strong gale	75–88 km/h (20.8-24.4 m/s) 47–54 mph 41–47 knot 20.8–24.4 m/s	7–10 m 23–32 ft	High waves whose crests sometimes roll over. Dense foam is blown along wind direction. Large amounts of airborne spray may begin to reduce visibility.	Some branches break off trees, and some small trees blow over. Construction/temporary signs and barricades blow over.

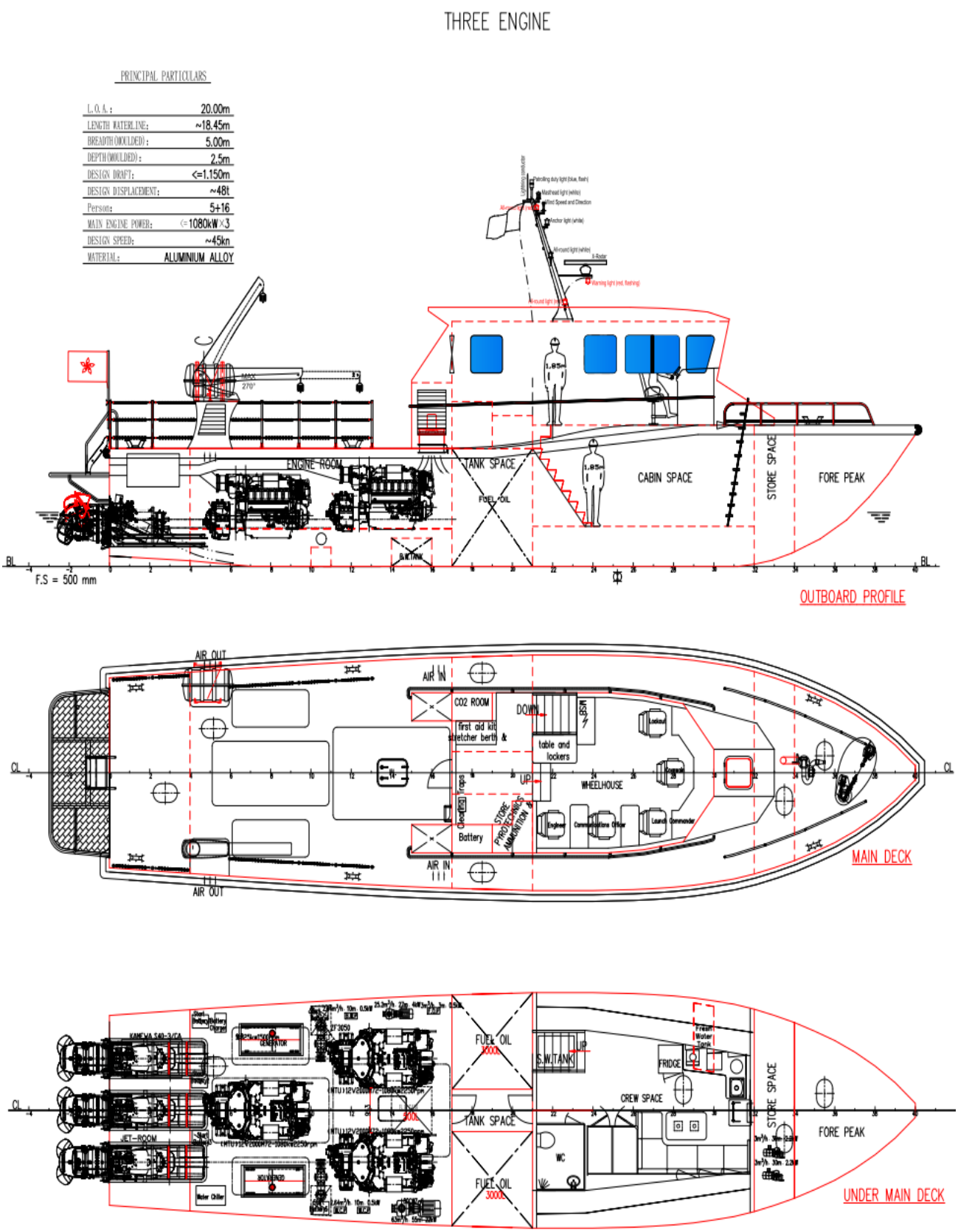
10	Storm, whole gale	89–102 km/h (24.7-28.3 m/s) 55–63 mph 48–55 knot 24.5–28.4 m/s	9–12.5 m 29–41 ft	Very high waves with overhanging crests. Large patches of foam from wave crests give the sea a white appearance. Considerable tumbling of waves with heavy impact. Large amounts of airborne spray reduce visibility.	Trees are broken off or uprooted, saplings bent and deformed. Poorly attached asphalt shingles and shingles in poor condition peel off roofs.
11	Violent storm	103–117 km/h (28.6-32.5 m/s) 64–73 mph 56–63 knot 28.5–32.6 m/s	11.5–16 m 37–52 ft	Exceptionally high waves. Very large patches of foam, driven before the wind, cover much of the sea surface. Very large amounts of airborne spray severely reduce visibility.	Widespread damage to vegetation. Many roofing surfaces are damaged; asphalt tiles that have curled up and/or fractured due to age may break away completely.
12	Hurricane	≥ 118 km/h (≥ 32.8 m/s) ≥ 74 mph ≥ 64 knot ≥ 32.7 m/s	≥ 14 m ≥ 46 ft	Huge waves. Sea is completely white with foam and spray. Air is filled with driving spray, greatly reducing visibility.	Very widespread damage to vegetation. Some windows may break; mobile homes and poorly constructed sheds and barns are damaged. Debris and unsecured objects are hurled about.

World Meteorological Organization (WMO) Sea State Code		
Sea State Code	Wave Height (meters)	Characteristics
0	0	Calm (glassy)
1	0 to 0.1	Calm (rippled)
2	0.1 to 0.5	Smooth (wavelets)
3	0.5 to 1.25	Slight
4	1.25 to 2.5	Moderate
5	2.5 to 4	Rough
6	4 to 6	Very rough
7	6 to 9	High
8	9 to 14	Very high
9	Over 14	Phenomenal
Character of the Sea Swell		
	0. None	
Low	1. Short or average 2. Long	
Moderate	3. Short 4. Average 5. Long	
Heavy	6. Short 7. Average 8. Long	
	9. Confused	

Part VII - Annex 9 – List of Recognised Organisations

Acronym	Name
ABS	American Bureau of Shipping
BV	Bureau Veritas SA
CCS	China Classification Society
DNV	DNV AS
KR	Korean Register
LR	Lloyd's Register Group Limited
NK	Nippon Kaiji Kyokai
RINA	RINA Services S.p.A.
RS	Russian Maritime Register of Shipping

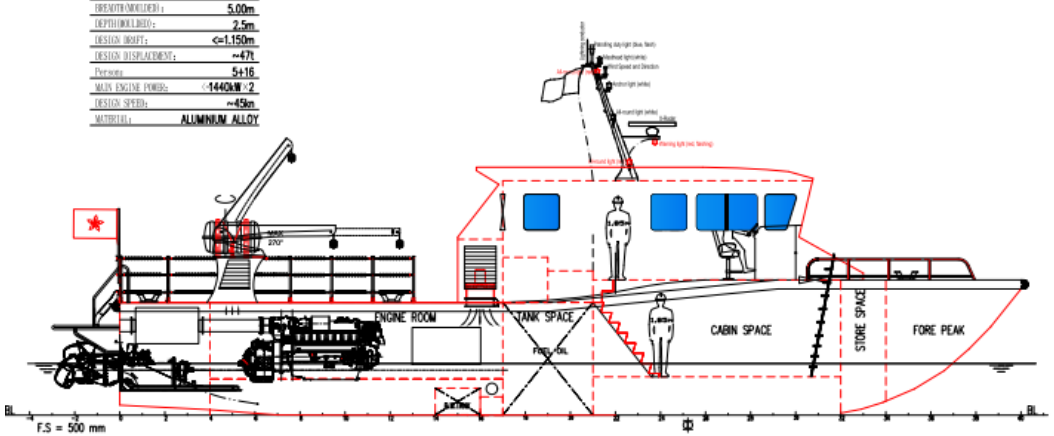
Part VII - Annex 10 – Conceptual General Arrangement Plan



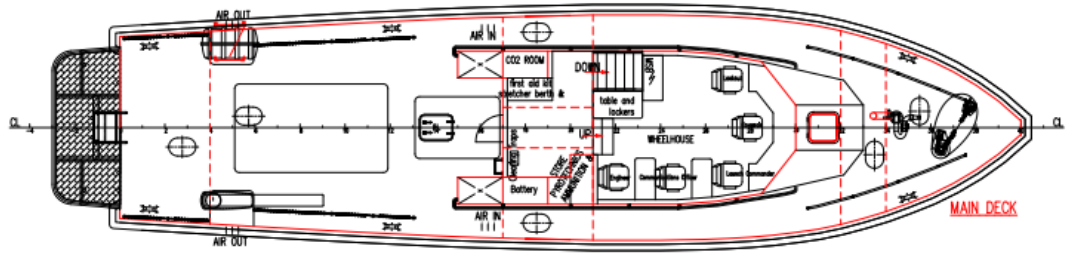
DUAL–ENGINE

PRINCIPAL PARTICULARS

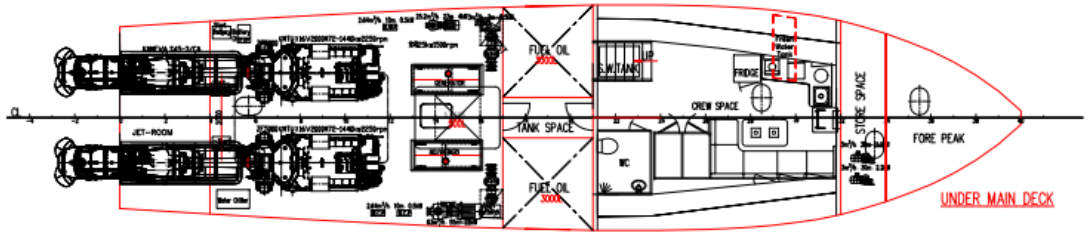
L.O.A.:	20.00m
LENGTH WATERLINE:	≈18.45m
BREADTH(MOULDED):	5.00m
DEPTH(MOULDED):	2.5m
DESIGN DRAFT:	<=1.150m
DESIGN DISPLACEMENT:	≈47t
Persons:	5+16
MAIN ENGINE POWER:	1440kW×2
DESIGN SPEED:	≈45kn
MATERIAL:	ALUMINIUM ALLOY



OUTBOARD PROFILE



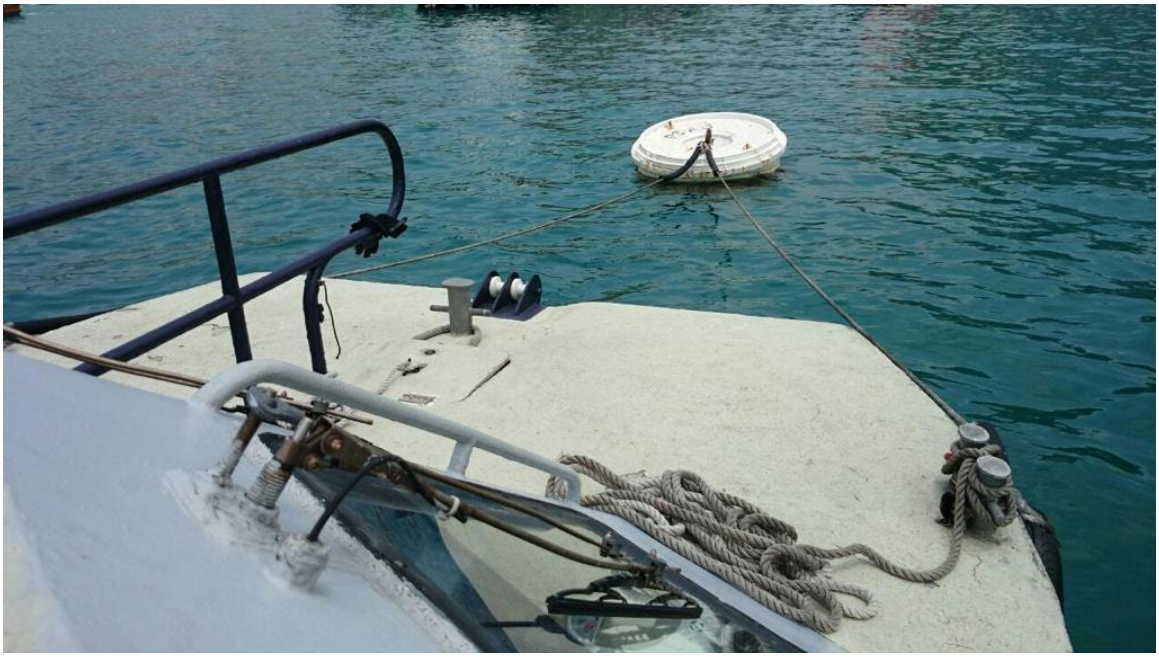
MAIN DECK



UNDER MAIN DECK

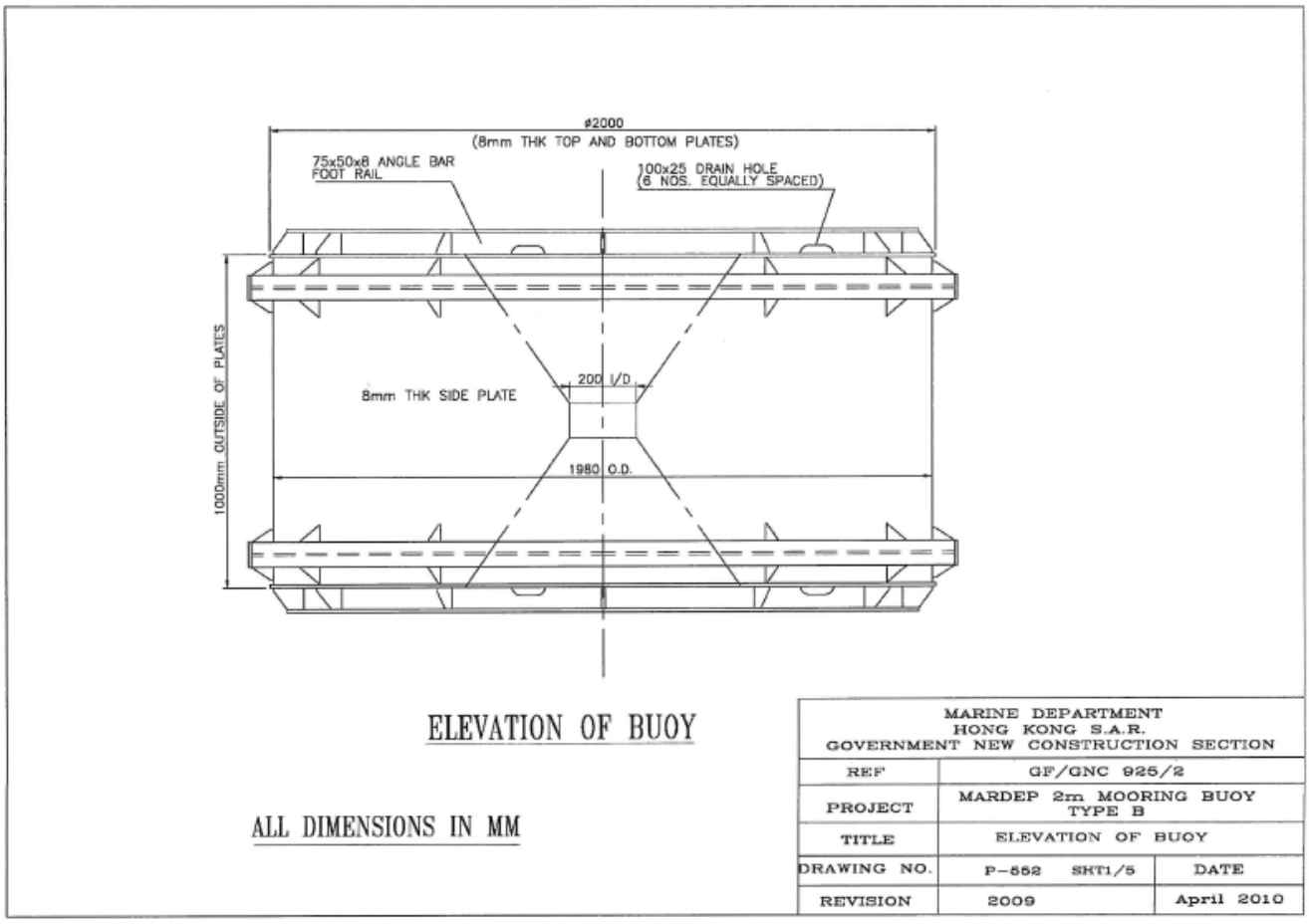
Part VII - Annex 11 – Typhoon Mooring Arrangement

Operating on a MARDEP 2.0m Mooring Buoy




M1501
PH-KT

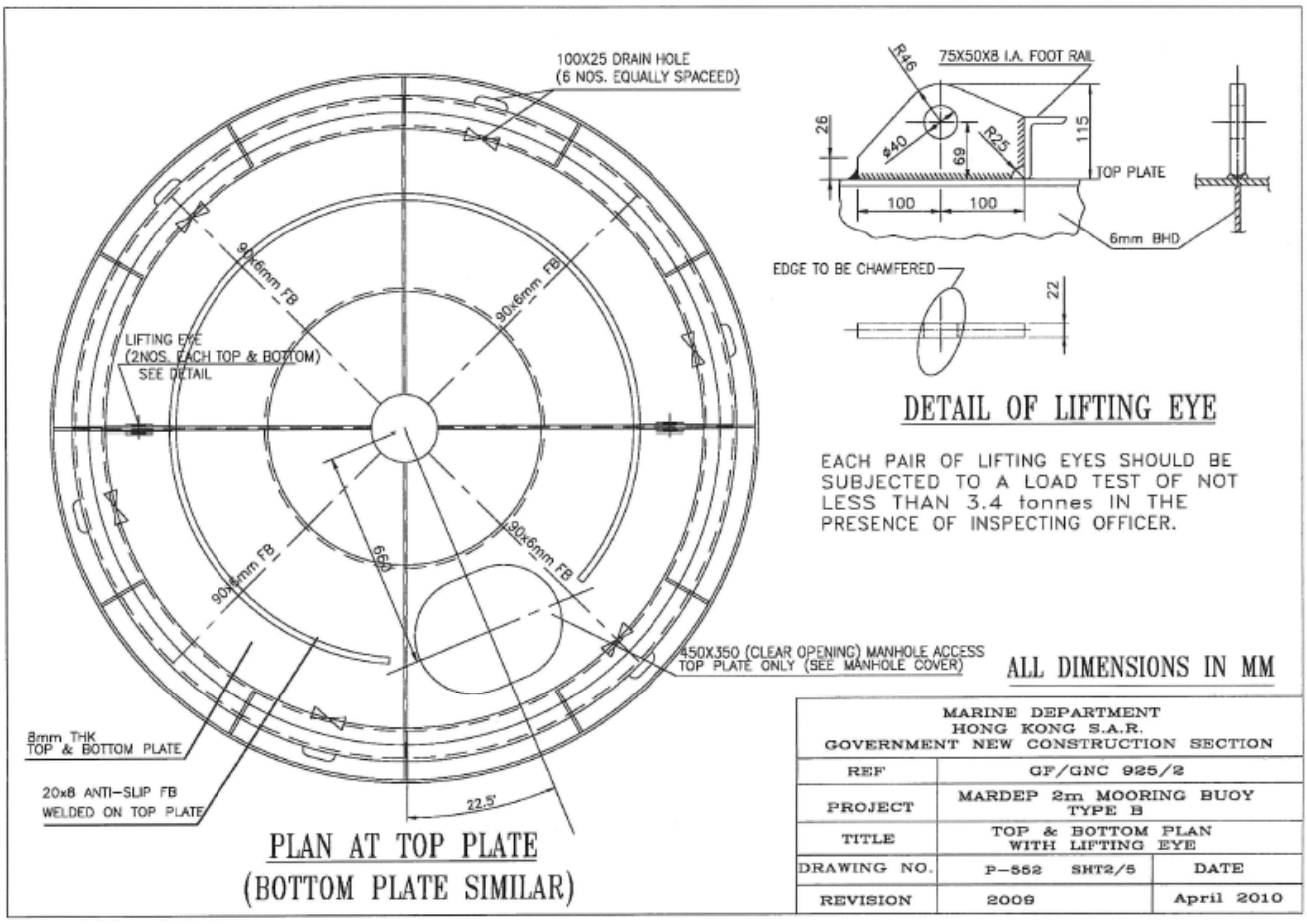
MARDEP 2.00m Mooring Buoy



ELEVATION OF BUOY

ALL DIMENSIONS IN MM

MARINE DEPARTMENT HONG KONG S.A.R. GOVERNMENT NEW CONSTRUCTION SECTION		
REF	GF/GNC 925/2	
PROJECT	MARDEP 2m MOORING BUOY TYPE B	
TITLE	ELEVATION OF BUOY	
DRAWING NO.	P-552 SHT1/5	DATE
REVISION	2009	April 2010



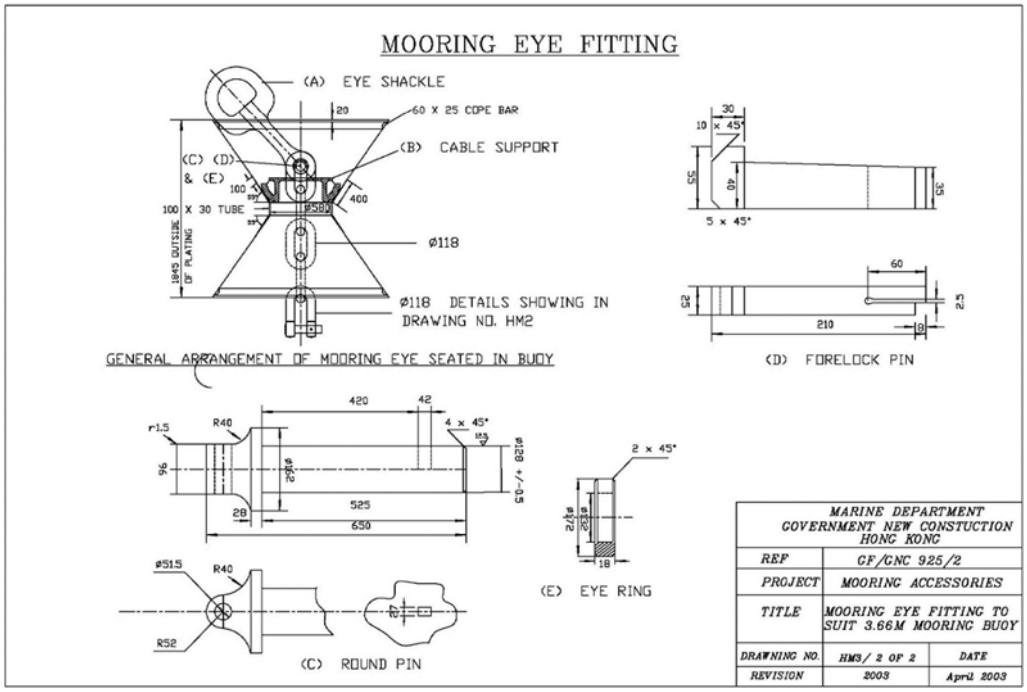
PLAN AT TOP PLATE
(BOTTOM PLATE SIMILAR)

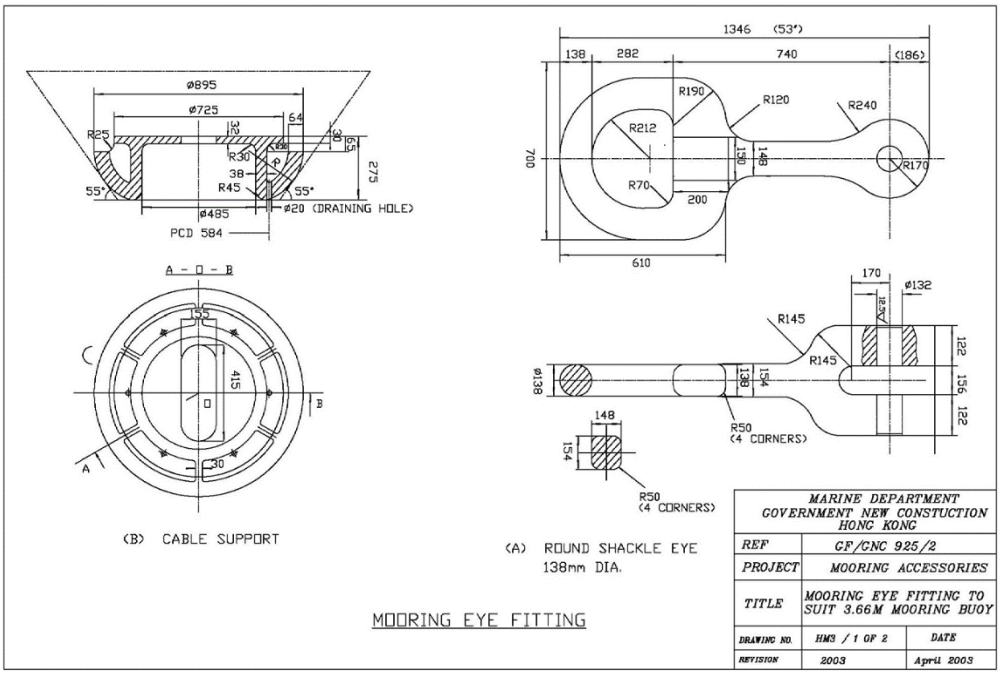
DETAIL OF LIFTING EYE

EACH PAIR OF LIFTING EYES SHOULD BE SUBJECTED TO A LOAD TEST OF NOT LESS THAN 3.4 tonnes IN THE PRESENCE OF INSPECTING OFFICER.

ALL DIMENSIONS IN MM

MARINE DEPARTMENT HONG KONG S.A.R. GOVERNMENT NEW CONSTRUCTION SECTION		
REF	GF/GNC 925/2	
PROJECT	MARDEP 2m MOORING BUOY TYPE B	
TITLE	TOP & BOTTOM PLAN WITH LIFTING EYE	
DRAWING NO.	P-552 SHT2/5	DATE
REVISION	2009	April 2010


MOORING EYE FITTING
(A) EYE SHACKLE
60 X 25 COPE BAR
(B) CABLE SUPPORT
(C) (D) & (E)
100 X 30 TUBE
Ø118
Ø118 DETAILS SHOWING IN DRAWING NO. HM2
GENERAL ARRANGEMENT OF MOORING EYE SEATED IN BUOY
(D) FORELOCK PIN
(E) EYE RING
(C) ROUND PIN
MARINE DEPARTMENT
GOVERNMENT NEW CONSTUCTION
HONG KONG
REF
CF/GNC 925/2
PROJECT
MOORING ACCESSORIES
TITLE
MOORING EYE FITTING TO SUIT 3.66M MOORING BUOY
DRAWNING NO.
HM3/ 2 OF 2
DATE
REVISION
2003
April 2003


(B) CABLE SUPPORT
(A) ROUND SHACKLE EYE
138mm DIA.
MOORING EYE FITTING
MARINE DEPARTMENT
GOVERNMENT NEW CONSTUCTION
HONG KONG
REF
CF/GNC 925/2
PROJECT
MOORING ACCESSORIES
TITLE
MOORING EYE FITTING TO SUIT 3.66M MOORING BUOY
DRAWING NO.
HM3 / 1 OF 2
DATE
REVISION
2003
April 2003

Meaning of signals

1 A tropical cyclone is centred within about 800 kilometres (km) of Hong Kong and may affect the territory.

3 Strong wind is expected or blowing generally in Hong Kong near sea level, with a sustained speed of 41-62 kilometres per hour (km/h), and gusts which may exceed 110 km/h, and the wind condition is expected to persist.

8 Gale or storm force wind is expected or blowing generally in Hong Kong near sea level, with a sustained wind speed of 63-117 km/h from the quarter indicated and gusts which may exceed 180 km/h, and the wind condition is expected to persist.

9 Gale or storm force wind is increasing or expected to increase significantly in strength.

10 Hurricane force wind is expected or blowing with sustained speed reaching upwards from 118 km/h and gusts that may exceed 220 km/h.

Important points to note

- The weather in different parts of Hong Kong cannot be simply inferred from the signal issued. Simply knowing what signal is issued is not enough. You should take note of the latest tropical cyclone information and related announcements broadcast on radio and TV, and given in the Hong Kong Observatory's Internet website (http://www.hko.gov.hk and http://www.weather.gov.hk) and Dial-a-Weather system (Tel. No.: 1878 200) to decide on the actions to take in response to the signal issued.
- Tropical cyclone warning signals are to warn the public of the threat of WINDS associated with a tropical cyclone.
- Owing to local topographical conditions or the presence of buildings nearby, winds at your locality may be substantially different from the general wind strength over Hong Kong. Winds are often stronger over offshore waters and on high ground. Winds are less strong in areas sheltered from the prevailing wind direction.
- The Hong Kong Observatory provides to the public detailed information on regional wind and rain through a diversity of channels, especially the Internet. Members of the public should consider their own circumstances and level of acceptable risk when taking precautions in response to warnings.
- When the No.1 signal is issued, you should take the existence of the tropical cyclone into account in planning your activities and beware that strong winds may occur over offshore waters.
- When the No.3 signal is issued, secure all loose objects, particularly on balconies and roof tops. Secure hoardings, scaffoldings and temporary structures. Winds are normally expected to become generally strong in Hong Kong within 12 hours after this signal is issued. Winds over offshore waters and on high ground may reach gale force.
- When the No.8 signal is issued, complete all precautions before gales commence. Winds are normally expected to reach gale force generally in Hong Kong within 12 hours after No.8 signal replaces No.3 signal.
- When the No.9 or No.10 signal is issued, all precautions should be completed. Stay indoors and away from exposed windows and doors to avoid flying debris.

信號的意義

1 有一熱帶氣旋集結於香港約800公里的範圍內，可能影響本港。

3 香港近海平面處現正或預料會普遍吹強風，持續風力達每小時41至62公里，陣風更可能超過每小時110公里，且風勢可能持續。

8 香港近海平面處現正或預料會普遍受烈風或暴風從信號所示方向吹襲，持續風力達每小時63至117公里，陣風更可能超過每小時180公里，且風勢可能持續。

9 烈風或暴風的風力現正或預料會顯著加強。

10 風力現正或預料會達到颶風程度，持續風力達每小時118公里或以上，陣風更可能超過每小時220公里。

注意事項

- 香港不同地區的天氣情況不能夠單憑發出的信號推斷。只知道發出了什麼信號並不足夠，你應該留意電台、電視台及天文台網頁（網址為 http://www.hko.gov.hk 和 http://www.weather.gov.hk）及「打電話問天氣」系統（電話號碼：1878 200）所提供的熱帶氣旋最新消息及有關報告，然後就發出的信號決定採取適當的相應行動。
- 發出熱帶氣旋警告信號，是為了警告市民熱帶氣旋帶來的**風力**威脅。
- 受地形或鄰近建築物影響，你所在區域的風力與香港普遍風勢可能有顯著差異。離岸海域及高地風力通常較強，不當風的地區風力較弱。
- 天文台透過多種途徑，特別是互聯網，向公眾提供各區風力及雨量的詳細資料。市民應該因應各自的具體情況和可接受的風險水平，就警告採取適當的預防措施。
- 1號信號發出後，計劃活動時，要考慮熱帶氣旋的影響，並注意離岸海域可能有強風。
- 3號信號發出後，應把所有容易被風吹動的物件綁緊，置於露台及屋頂的物件更要綁緊；圍板、棚架和臨時建築物亦應鞏固。發出3號信號後，通常在12小時之內香港會普遍吹強風，在離岸海域及高地的風力更可能達烈風程度。
- 8號信號發出後，應在烈風吹襲前完成所有預防措施。8號信號取代3號信號後，通常在12小時之內香港普遍風力會達烈風程度。
- 發出9號或10號信號時，市民應已採取所有預防措施。這時切勿外出，並應遠離當風的門窗，以免被隨風吹來的碎片擊中。

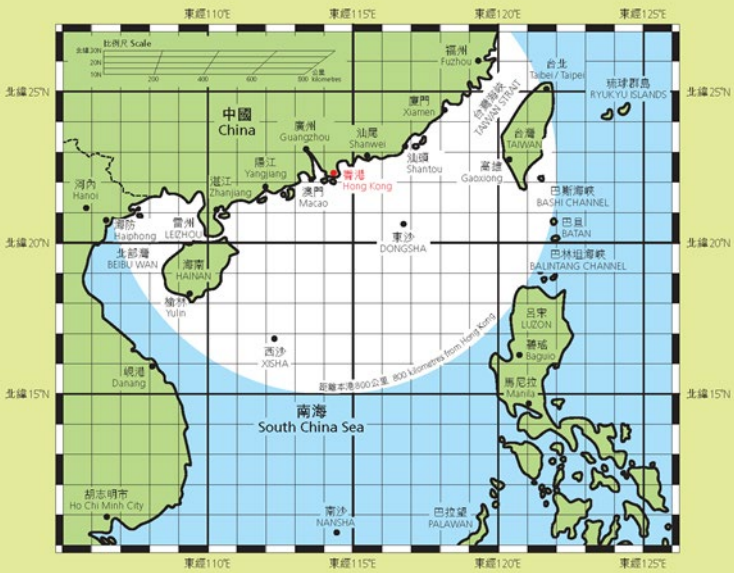
香港天文台
Hong Kong Observatory

香港熱帶氣旋警告信號
Hong Kong's Tropical Cyclone Warning Signals

1	T	戒備 Standby
3	⊥	強風 Strong Wind
8 西北 NW	▲	西北烈風或暴風 NW'LY Gale or Storm
8 西南 SW	▼	西南烈風或暴風 SW'LY Gale or Storm
8 東北 NE	▲▲	東北烈風或暴風 NE'LY Gale or Storm
8 東南 SE	▼▼	東南烈風或暴風 SE'LY Gale or Storm
9	⧗	烈風或暴風風力增強 Increasing Gale or Storm
10	✚	颶風 Hurricane

香港 Hong Kong

熱帶氣旋途徑繪畫圖
Tropical Cyclone Plotting Map



熱帶氣旋按下表分類
Tropical cyclones are classified as follows

	中心附近之最高持續風速（公里/小時） Maximum sustained winds near the centre (km/h)
熱帶低氣壓 Tropical Depression	62 或以下 or below
熱帶風暴 Tropical Storm	63 - 87
強烈熱帶風暴 Severe Tropical Storm	88 - 117
颱風 Typhoon	118 - 149
強颱風 Severe Typhoon	150 - 184
超強颱風 Super Typhoon	185 或以上 or more

在繪畫熱帶氣旋中心的移動途徑時，應留意偶然會出現偏離了一般動向的短期不規則性移動。出現這類偏差的原因部份由於確定熱帶氣旋中心位置的困難，而部份亦由於中心移動的方向及速度有短期性波動。

熱帶氣旋移動方向及超聯香港的方位均以十六點方位表示，因此報告中的方位與實際方位可能相差達11¼度。例如，一颱風中心位於香港79至101度的任何方位，向259至281度任何方向移動，均可稱為"東經在香港以東…向西移動…。"運並非一定表示該颱風直趨香港，因其移動途徑與"直指香港"途徑之間可能相差達22度。

When plotting the track of the centre of a tropical cyclone, it is important to note that there can be short term erratic departures from the general direction of movement. These departures are partly due to difficulties in locating the centre of the tropical cyclone, and partly due to short term fluctuations in the direction and speed of movement of the centre.

The direction towards which a tropical cyclone is moving and the bearing of its centre from Hong Kong are each given to the nearest point of a 16-point compass bearing. Thus the actual bearing will be within 11¼° of the reported value. For example, the centre of a typhoon on any bearing between 79° and 101° and moving on any heading between 259° and 281° is said to be "centred.....east of Hong Kong and moving west....." It will be seen that this statement does not necessarily mean that the centre is heading directly towards Hong Kong as its course could be as much as 22° off the direct "collision" course.

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Part VII - Annex 12 – Tenderer's Presentation

1. General

1.1 The Tenderers, which have passed the Stage 1 and 2 of the Tender Evaluation Procedures, are required, at the discretion of the Government and at their own costs and expenses, to make a verbal presentation of their proposals to the Government Representatives within twenty-one (21) calendar days upon notice. The presentation shall be conducted by a team of qualified persons who are authorized by the Tenderer. In person face-to-face presentation is preferred, which should be held at Government premises as designated by the Government Representatives as far as practicable. Presentation by way of video conference may also be considered at the Government's discretion.

1.2 The Tenderer shall introduce, explain and clarify their tender proposals during the presentation. In no circumstances should additional information or new/amended proposal not set out in their tender submissions be accepted. Tender assessment will be made solely based on the Technical Proposal submitted before the Tender Closing Date. The presentation will **not** be taken into account in marking under the Marking Scheme in Annex D to Part II – Conditions of Tender.

1.3 The Tenderer shall focus on presenting the Technical Proposal submitted in respect of its proposed design and solutions to be adopted, Counter-Proposals as well as the Excess Proposals therein involving higher standard of specifications and proposed innovative suggestions, if applicable. The scope of presentation shall be strictly based on and within the contents of the Tenderer's Technical Proposal submitted, without any disclosure, clarification or deliberation of the Price Proposal submitted. Organisation introduction and brief of the company profile should be kept to the minimum, which should not be more than five (5) minutes. The length of presentation shall not exceed three (3) hours.

1.4 The presentation shall be followed by a Question and Answer Section for the Government Representatives to make further enquiry about the Tenderer's Technical Proposal and presentation. Such Question and Answer Section should not be construed as any commitment by the Government. Any requests from the Tenderer for the Government to provide additional information about the tender requirements laid down in the Tender Documents or other vessel project plans of the Government will **not** be accepted.

2. Scope of Presentation

2.1 According to the requirements set out in Paragraphs 1.1 to 1.3 above, the presentation shall cover the following topics and follow the numbering sequence below.

(1) Organisation Introduction (not more than five minutes)

(2) Hull and Deckhouse

(3) General Arrangement

(4) Fire Safety Equipment

(5) Lifesaving Appliances and Arrangements

(6) Machinery

(7) Electrical System

(8) Operational Systems

(9) Waterjet System

(10) Innovation Suggestions

Part VII - Annex 13 – B5 Diesel Specification

B5 Diesel

TEST ITEM	UNIT	TEST METHOD	SPECIFICATION
Density at 15℃	℃	ASTM D-1298	0.83 - 0.84 max.
Colour	---	ASTM D-1500	1.5 max.
Cetane Number	---	ASTM D-613	51 min.
Cetane Index	---	ASTM D-4737	51 min.
Cold Filter Plugging Point	℃	IP-309	-3 max. (A) 21max. (B)
Distillation Recovery at 250℃ 95% Recovery	Vol% ℃	ASTM D-86	65 max. 355 max.
Flash Point	℃	ASTM D-93	66 min.
Sulfur	wt%	ASTM D-5453	0.001 max.
Kinematic Viscosity at 40℃	Cst	ASTM D-445	2.0-4.5
Acid Number Strong	mgKOH/g	ASTM D-974	Nil
Total	mgKOH/g		0.25 max.
Ash	wt%	ASTM D-482	0.01 max.
Conrandson Carbon	wt%	ASTM D-189	0.1 max.
Water content	Vol%	ASTM D-95	0.05 max.
Copper Strip Corrosion 1 Hours/100℃	---	ASTM D-130	No. 1 max.
Lubricity (HFRR)	Micron		460 max.
Polycyclic Aromatic Hyrocarbon	wt%	IP 391	11 max.
Cloud point	℃	ASTM D-2500	-3 max. (A) 21 max. (B)
FAMEs (biodiesel) content	wt%	EN14078	4.5 - 5.5
Diesel content	wt%		94.5min.
Calorific Value	MJ/kg	ASTM D-240	45 min

REMARKS : (A): WINTER: Nov. - Feb.
(B): SUMMER: Mar. - Oct.

Part VII – Annex 14 – Handling Assessment ("HA") at Pre-shipment Construction and Handling Inspection

1. General

1.1 The purpose of the HA is to:

(a) ensure that the offered Vessel's performance characteristics are compatible with the HKPF's operational role; and

(b) mitigate the risks to all parties associated with potential rejection of a constructed vessel at the Technical Acceptance and the Delivery Acceptance.

1.2 The Contractor shall arrange for a HA of the completed Vessel to be assessed by the Contractor, in the presence of MD's and HKPF's representatives, at or near the site where the Vessel is constructed. The HA shall be conducted and completed within two (2) working days. At least ten (10) working days in advance of the HA, the Contractor shall submit for MD's approval a HA programme proposal which includes details of the procedures under which the HA is to be conducted and the formats in which the Contractor proposes to capture and present the data recorded by the device(s) in accordance with Paragraph 1.4 of this Annex 14 and the digital video footage recorded in accordance with Paragraphs 1.5 and 1.6 of this Annex 14 during the HA. For the avoidance of doubt, this data and video footage shall be able to be copied, moved, deleted and played using Microsoft Windows' built-in software. Otherwise, the Contractor shall supply appropriate computer software that is compatible with Microsoft Windows for the reviewing of this data and the video footage at no extra cost to the Government. The HA shall be observed by the Government Representatives. At least one (1) of the HKPF's representatives shall be aboard the Vessel to be assessed to monitor and verify the conduct and results of each attempt at an assessment.

1.3 The Vessel to be assessed shall be completed and ready for delivery.

1.4 The Contractor shall ensure that an objective record (which can be reviewed by the Government Representatives or, if necessary, an independent third party such as a RO) of the date, time, position, speed, course, roll, pitch, yaw, trim, running angle and three-dimensional acceleration data generated during the HA. The HA shall be conducted in accordance with the assessment protocols stipulated in Paragraphs 2.1 to 2.2 of this Annex 14 and captured using a suitable device(s) which has/have been properly calibrated and, if required by the Government, with supporting calibration documents issued by the manufacturer or calibration laboratory.

1.5 The Contractor shall, throughout the HA, record date and time stamped aerial digital video footage of the Vessel to be assessed and, using digital video recording equipment affixed at appropriate locations as agreed by the HKPF on the Vessel to be assessed, record digital video footage of the:

(a) field of view from the control console forward over the bow to the horizon. For the avoidance of doubt, the camera shall be mounted on the longitudinal centre line at a height and distance from the bow which shall correspond with the eye position of a coxswain, 1.64 metres tall, seated at the helm;

(b) position of the helm and throttle controls at all times; and

(c) view facing astern with the field of vision centred on the longitudinal centre line of the Vessel to be assessed with the camera mounted as closed as possible at the transom.

1.6 The Contractor shall provide a suitable logistics boat from which the Contractor shall record digital video footage of the Vessel to be assessed undergoing the HA. This logistics boat shall be capable of a comparable speed and be piloted at a distance and position from the Vessel to be assessed.

1.7 The Contractor shall, immediately after the HA, provide to the Government Representatives the following:

(a) an electronic and printed record of the data recorded during the HA in a format(s) approved by MD in accordance with Paragraph 1.2 above by the device(s) stipulated at Paragraph 1.4 of this Annex which includes:

(i) the raw data captured in respect of each assessment protocol specified in Paragraphs 2.1 to 2.2 of this Annex 14;

(ii) a graphical depiction of each assessment showing the position and the track of the Vessel to be assessed throughout the assessment; and

(iii) on one chart the speed in knots and the roll and the pitch in degrees;

(b) the following copies of the digital video footage stipulated in Paragraphs 1.5 and 1.6 of this Annex 14 stored on a digital storage medium in a format approved by MD in accordance with Paragraph 1.2 above, namely:

(i) aerial digital video footage;

(ii) fixed digital video footage captured from the Vessel; and

(iii) digital video footage captured from the logistics boat.

(c) a certificate, signed by both the Contractor and a Government Representative, which records accurately the actual Loading Condition of the Vessel as described in Paragraph 1.8.2(e) of this Part VII during each assessment of the HA.

1.8 The assessment protocols listed in Paragraphs 2.1 to 2.2 of this Annex shall be conducted in sea states conforming to WMO Sea States 0 to 2 as specified at Annex 8 of this Part VII, unless otherwise agreed with the Government Representative.

1.9 The Vessel to be assessed is required to complete and pass each of the assessments set out in Paragraphs 2.1 to 2.2 below. The Contractor shall have no more than five (5) attempts in total to complete and pass each of these assessments. If, at any time during an assessment, a Government Representative considers that it is unsafe to continue that assessment, the assessment shall be terminated immediately and that assessment shall be deemed to have been failed.

2. Assessment Protocols

2.1 Handling Assessment – Light Operational Load Condition

The following assessment shall be conducted at Light Operational Load Condition as specified at Paragraph 1.8.2(e) of this Part VII.

2.1.1 Straight Line Assessment

(a) The coxswain shall accelerate from stationary to at least forty-five (45) knots within thirty (30) seconds. At any time during this assessment, the bow of the Vessel should not rise above the horizon line with the automatic trim control system (if fitted) turned off. Should the bow rise above the horizon line with the automatic trim control system (if fitted) turned off, it shall not be for more than five (5) seconds as evidenced by the digital video footage. If the Vessel to be assessed does not achieve this, it shall be deemed to have failed the assessment.

(b) If the Vessel, maintaining the same course and settings, does not maintain a mean speed of at least forty-five (45) knots for a period of no less than one (1) minute, the Vessel shall be deemed to have failed this assessment.

2.2 Handling Assessment – Full Operational Load Condition

The following assessments shall be conducted at Full Operational Load Condition as specified at Paragraph 1.8.2(e) of this Part VII.

2.2.1 Straight Line Assessment

(a) The coxswain shall accelerate from stationary to at least forty (40) knots within thirty (30) seconds. At any time during this assessment, the bow of the Vessel should not rise above the horizon line with the automatic trim control system (if fitted) turned off. Should the bow rise above the horizon line with the automatic trim control system (if fitted) turned off, it shall not be for more than five (5) seconds as evidenced by the digital video footage. If the Vessel to be assessed does not achieve this, it shall be deemed to have failed the assessment.

(b) If the Vessel, maintaining the same course and settings, does not maintain a mean speed of at least forty (40) knots for a period of no less than one (1) minute, the Vessel shall be deemed to have failed this assessment.

2.2.2 Speed Transition Assessment

(a) The coxswain shall accelerate from stationary to five (5) knots and, once the Vessel reaches five (5) knots, maintain course and settings for a period of no less than one (1) minute.

(b) The coxswain shall then accelerate from five (5) knots to ten (10) knots and, again, maintain course and settings for a period of no less than one (1) minute.

(c) This assessment protocol shall be repeated incrementally at successive five (5) knot intervals until the maximum achievable speed has been reached.

(d) At each successive speed increment, the Vessel shall hold that speed within a range of ± 10% for the full one (1) minute.

(e) During this assessment protocol, the bow of the Vessel shall not rise above the horizon line. Should the bow rise above the horizon line, it shall not be for more than five (5) seconds as evidenced by the digital video footage. If the Vessel to be assessed does not achieve this requirement it shall be deemed to have failed the assessment.

2.2.3 Directional Control Assessment

(a) The coxswain shall bring the vessel to a speed of forty (40) knots with the ride control system (if fitted) turned off.

(b) At this juncture and if safe to do so, the coxswain shall remove his hands from the controls. Without human interference in respect of helm, throttle or trim the vessel shall not deviate from its base heading by more than five (5) degrees within a period of twenty (20) seconds.

2.2.4 Avoidance Line Assessment

An avoidance line test shall be conducted in accordance with the test procedures as in ISO 6185-4, except the loading condition and the distance from the point of start-to-turn to the imaginary line of maximum distance being seventy (70) metres. The vessel shall be required to demonstrate a maximal manoeuvring speed at no less than forty-five (45) knots.

2.2.5 U-Turn Test

(a) The vessel to be assessed shall make a straight line course in a direction perpendicular to an imaginary line with three (3) collinear marker buoys on the imaginary line, as shown in the diagram below. MB1, MB2 and MB3 are the marking buoys each being twenty-five (25) metres apart.

(b) When the vessel crosses the imaginary line at S1 which is anywhere between MB1 and MB2, the speed of the vessel shall be not less than forty (40) knots, turning to the starboard side (as indicated by the green line) with any speed that is safe to drive and making a U-turn with the vessel crossing the imaginary line again at S2 which is anywhere between MB2 and MB3. The speed of the vessel shall be not less than forty (40) knots at S2 or after crossing the imaginary line again. The time measured from S1 to the point at or after the vessel crosses the imaginary line and regains a speed of forty (40) knots shall not exceed twenty-five (25) seconds.

(c) The vessel to be assessed shall then repeat the test described at Paragraph 2.2.5(a) and (b) of this Part VII (Annex 14) but this time crossing the imaginary line anywhere between MB2 and MB3 and turning to the portside (as indicated by the red line).